The New Channel from Rotterdam to the North Sea.*

BY VAN HORN.

Three large rivers, the Schelde, the Maas and the Rhine, run through Holland and issue into the North sea, the distance between the most northern and the most southern one being about fifty-one miles. They discharge through five mouths, which are called: Maas, Haringvliet, Grevelingen-Krammer, Oster-Schelde and Wester-Schelde (Fig. 2). The principal channel —besides the Wester-Schelde—is the Maas, being the natural way from the sea to the city of Rotterdam, situated about 18.5 miles inland. The Maas forms two branches, the Old Maas issues near Brielle, the New Maas at the Hoek van Holland. In front of both rivers are large and shallow bars, which made the construction of a better waterway a necessity. In 1851-53 the Merwede, between Gorinchem and Dordrecht, above Rotterdam, was corrected for the purpose of leading the water, which was deviated through the Biesbosch and Holland Diep, back into the Maas. This improvement was not sufficient to prevent the increase of the bar at the Hoek van Holland. Then the channel of Haringvliet was improved and the Voornes canal was dug between Hellevoetsluis and Nieuwesluis, connecting the Haringvliet with the Maas. This improvement was not sufficient for large ocean vessels, and the necessity arose to provide for an entirely new waterway to Rotterdam.

The incessant reforming of bars in front of the mouth of the Old and New Maas made the selection of an entirely new channel necessary, also diversion of the mainchannel—as much as other interests and rights permitted—into this new channel. A commission of government engineers proposed the plan, shown in Fig. 1, which has been actually carried out.

The main points of this proposition were: "To make a cut through the dunes and the land behind them, 3.1 miles long; to close the old Maas, passing Hoek van Holland; to construct two jetties, reaching far into the sea; to regulate the river above the new cut; to construct a large dike from the dunes to the split of the Maas (Nieuwen or Brielles Maas), 10.5 miles long; and finally to construct a canal with locks, connecting the Brielles Maas with the new channel."

If these works should prove not to be sufficient to form a deep channel and to maintain the same, the additional remedy was then to improve the Maas from the closed mouth of the Old Maas upstream, which will increase the scouring power of the river and will assist the improvement efficiently. This plan has been carried out and is now finished.

The official soundings have shown that the depth has increased from 3.3 feet to 5 feet since the improvements have been made: a depth of 16.5 feet below mean low tide can be obtained by dredging at the mouth; this gives a depth of 21.4 feet at high tide, the difference between the tides being 5.5 feet. What additional works have to be carried out yet, cannot be predicted, as the time elapsed since the completion of the first improvement, is too short, and the sand is not deposited uniformly, but varying with the weather. The government engineers in charge of these works are not too sanguine, and are fully prepared to be obliged to carry out additional works, even at a large cost.

To understand the many difficulties encountered in building a new outlet on sandy, movable shores, like that in question, it is necessary to consider the causes of the heavy sand-drifts and to study the investigations made and the conclusions drawn.

The new outlet is not exposed to such deposits as the harbor of Ymuiden, at the mouth of the North sea canal, which connects Amsterdam with the North sea. The reason of this is, that the large river Maas discharges into the ocean between two jetties, using the natural scouring power of the water to deepen the channel. One of the principal questions to be decided in this undertaking was "how long shall the jetties be and how wide the entrance?" The experience gained at the new harbor of Ymuiden showed that the jetties prevent the formation of sand bars to a large extent. The jetties affect the formation of the west coast of Holland in the same manner as the spurs constructed for the protection of the sea-shore.

While the low water forms a concave line between two adjoining spurs, the curvature of which depends upon the depth in front of the spurs and distance between the same, the beach along the sides of the spurs and the shore increases to a length one to one and a half times the length of the spurs. If the spurs are along a concave shore, where the depth of water is greater near the shore, the spurs cannot prevent this increase; deep furrows are formed in front of and alongside the head of the spurs. As long as the improvement works are effectively kept up, the space between the spurs up to their head and even beyond them, will not fill up with sand. This is proved by the jetties of Ymuiden and of the new channel to Rotterdam. It can therefore be assumed as certain that the shore will not increase beyond the heads of the jetties.

The Government Commissioners demanded that the jetties should reach to a point where the currents of the ocean are undisturbed and regular. The course of the entrance is west-east in the direction of the prevailing winds.

The mouth of the new channel is formed by two parallel jetties, their heads having a course of N. W. to W.; its width is about 3,000 feet, which, however, proved to be too large. A third jetty, reaching up to low tide, was built between the first two.

In consideration of the great difficulties encountered in the construction of massive jetties on the Dutch coast, and the heavy expense of their construction and maintenance, as experienced at the harbor of Ymuiden, the Rotterdam jetties were built of fascines with rocks dumped upon them. These jetties are built for the purpose of taking up the tidal currents and forcing the same into the new channel-entrance; their purpose was not to be a protection against the waves nor to form a harbor secure against the high tide. The incoming ships can continue their course undisturbed into the river Maas, as no locks or other structures detain them. The high waves during strong west winds—although entering the new entrance—cannot endanger the vessels; the high waves decrease, going up stream. It was sufficient in the present case to build the jetties up to mean tide, so that the tidal current was confined to a certain channel during nearly the entire time of tide and so that the scouring power of the same as well as that of the outgoing ebb-current was utilized to keep the entrance deep enough. This facilitated the construction of the jetties considerably, as they were nothing else than spurs reaching far into the sea. The higher parts of the jetty, above mean high tide up to spring tide, were avoided, which are the most difficult parts of the entire structure, being exposed to the immense and powerful waves acting directly against the shore. These structures made of fascines required breakwaters to protect the rip-rap on top; these, however, were built at a small expense.

The experience gained with similar dams, built several centuries ago along very exposed sections of the Dutch coast, proved the efficiency of this kind of construction. Extensive reaches of the coast are protected by them, for instance, the Deep-land north of Hoek van Holland for a length of 3.1 miles, in North-Holland a length of 1.6 miles, and the upland partly broken dunes of a length of 3.1 miles in North Holland.

The jetties are made of heavily loaded mattresses up to low-water line, and above that line of single layers of fascines. Local conditions permitted this construction. As a rule the use of heavily loaded mattresses is impossible along the coast of Holland, there being no opportunity to make the mattresses with any degree of safety, nor to store the material and vessels. Temporary harbors and shelters would be necessary for making the mattresses; but this involves a large expense. Jetties at the mouths of rivers are built more easily of mattress work, as the river offers sufficient protection to the work and the vessels.

The destruction caused by teredos and similar wood worms—which usually prohibits the use of lumber, is of little importance in the present case on account of the low jetties. Among the protective works recently built at Pettem in North Holland and at West-Kapelle on the island of Walcheren in Zealand, are breakwaters for the protection of rock-filling and rip-rap, made of single rows of piles; the former customary connection of these rows of piles by long girders is no longer used as they are considered dangerous. The piles are protected against the ravages of the teredos by being creosoted, and by nails driven into them; the teredo begins to work only at half-tide.

The construction of the loaded mattresses is interesting. The mattress consists of a lower and an upper frame made of "brush-sausages," and of two or three layers of fascines laid between the frames and tightly pressed together. The completed mattress is 18 inches thick with three layers of fascines; these thin mattresses settle better, and join closer together, than thick ones. The frames are formed of two rows of sausages, crossing each other at right angles; the distance between them is 3 feet. The crossings of the sausages of the lower frame are secured by tarred ropes, 1¾ inches in circumference, after the ropes are drawn tight, their ends are fastened to posts, driven simultaneously, to connect later with the corresponding points of the upper frame. All the crossings of the outside sausages are connected in this way, while only every second crossing of the interior sausages. The crossings of the upper frames are secured by a double knot. The guide-ropes, for reaching the mattresses, 2¾ inches around, are fastened every 26 or 30 feet to the crossing points of the second sausage (united from the outside), these points being provided with iron eye-bolts, through which the rope is pulled. The lowest layer of fascines is laid square to the low water line, and the other layer square to the first. The lower sausages of the upper frame are square to the uppermost layer of the fascines. Hedges are always put upon the mattresses in structures along the ocean shore, to give a better hold to the rocks and stones filled in upon the loaded mattresses (as the latter is exposed for some time to the impact of the waves and the current, until it is covered by the next mattress) and further to force the fascines closer together, than can be done by sausages and ropes. Hedges were put up on the other sausages along the entire outside of the mattress; other hedges were also built on each second sausage, lengthwise as well as crossways. The longitudinal hedges being laid above the cross hedges—are secured on each fourth post by a so-called anchor post, which consists of a post with an oak or iron wedge through the head of it. The outside hedges have also such anchor posts. These hedges are considered as very important in Holland and are used extensively.

The rocks put upon the fascines, cannot be distributed very uniformly upon these fascines, after they are sunk. As the time allowed by the tide is too short to spread the rock evenly, the filling in is done in two sections; first only so much rock is used as is sufficient to sink the mattress. The balance is filled in later, when it can be done with greater regularity.

The mattresses used in these jetties are laid with broken joints; to fill up 10 square feet, 1,230 pounds of basalt rock were used. The largest loaded mattresses laid had a surface of 17,000 square feet. The spaces between two adjoining mattresses are filled carefully with rocks, so that no hollow spaces remain. The entire work was done by contract, the following prices having been paid:

For 10 square feet of loaded mattress, 18 inches thick, including making and sinking), 65 cents. For one ton of rock (2,000 lbs.) including dumping upon the mattresses, $1.31. These prices include the cost of buying, transporting, labor, loading and unloading, tools, maintenance of plant, etc, etc. Ten square feet of completed mattress, including the entire filling up with rock, cost $65 + \frac{1230}{2000} \times 1.31 = \$1.46$.

To understand the elevation given in the plate, it must be known that at the Hoek van Holland

mean high tide is at A. P. + 3.44 feet
mean low tide " " A. P. — 2.03 "

A. P. stands for "Amsterdam Pegel" which means the zero point of the Amsterdam gauge; this is the base of all the elevations of Northern Europe.

The average height of flood is then only 5.47 feet. The highest spring floods during the last ten years—not considering the waves, reached up to A. P. + 10.5 feet on December 2, 1867, and to A. P. + 9.84 on November 22, 1873, while an unusually low ebb-tide occurred on February 12, 1871, being A. P. — 6.56 feet.

The northern jetty is about 1.24 miles long, commencing at the foot of the dune; the crest is 29.5 feet wide and is 3.94 feet above low tide or at A. P. + 1.91 feet or 3.44 — 1.91 feet = 1.53 feet below high tide. The riverside slope is 1 : 1, the seaside slope 1.25 : 1. The steps of the mattresses are so far beyond the foot of the slopes, that the latter will not be steeper even in case the river or sea should become deeper along the side of the jetty. The steps in connection with the hedges, secure the rock filling and prevent its falling off. The rocks used for the crest to about 3.3 feet to 5.9 below low tide had a weight of at least 1100 pounds, to offer a sufficient resistance to the waves. In greater depths the weight of single rocks decreased to from 180 to 220 pounds. The top of the jetty is covered with a pavement of basalt blocks, 18 inches thick, and resting upon a base of loose rock. This pavement is held on its edges by a row of alternately round and square piles closely driven. Two square posts are set 3.3 feet apart from each other and driven firmly into the sea bottom; between is one round pole. Their tops reach up to 8.2 feet above low tide, serving at the same time as a protection to the rip-rap. A row of piles, 3.3 feet apart, with their tops 4.3 feet above low tide, is an additional protection to the seaside slope. Six rows of piles are driven on the crown; the two middle ones carry each a line of girders to support a railroad track. Rows of piles 6.6 feet apart, and at 90° to the water line of the jetty, divide the crown into squares, in which the rock pavement is set securely.

Fig. 3 shows the arrangement of the rows of piles. The width of the jetty is increased at its extreme end, partly to strengthen the same and partly to obtain the necessary space for a beacon light. In looking at Fig. 3 it must be taken into account that the sides reaching below low water have a gentle slope of 10 : 1, so that their foot reaches 330 feet farther into the sea. The rocks used in the upper part weigh at least 2200 pounds each; it was found, that rocks of 1100 pounds were too light, and were moved by the waves. A track was laid to the extreme end of the jetties, to unload heavy rocks and facilitate the work generally. So far no settlement has been observed; only slight damage

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has occurred, just before the permanent settlement of the structure in all its parts had taken place.

The top of the jetties is made as shown in Fig. 6; the rough surface breaks the power of the waves more effectually than a smooth surface; and no washout can occur. All other details of construction can be seen in Figs. 3 and 4.

The mode of constructing the southern jetty is the same as that of the northern; its dimensions and elevations and the arrangement of the piles are a little different.

The crown of this jetty is 1.97 feet higher than that of the northern, being 5.9 feet above low water, which is nearly the height of the flood. The purpose of this increased elevation is to force the current of the flood to run as long as possible into the entrance around the head of the jetty with increased velocity and to prevent the same from running square across the jetty at the end of the time of flood, thereby loosing force. The course of the flood current is east north-east.

To confine the entrance, a third dam was built; it is constructed less solidly. Its construction is shown in Figs. 7 to 15. It is made principally of loaded mattresses. The dam connecting this dam with the south jetty is 19.6 feet wide on top, and 1.64 feet above A. P. for a length of 1,000 feet. The rip-rap, put between five rows of piles, rests upon a base of broken bricks, this being secured against underwash by a layer of fascines lying upon a bed of reed. The latter is kept secure by six rows of hedgework (Fig. 8.). The first 2,590 feet of the training-dam are built of, respectively, one and two layers of mattresses, upon which lies a layer of fascines with rock-filling between six rows of piles (Figs. 9 and 10.). The lower mattresses on the inner side reach far into the river, to secure the dam against underwashing. The slopes are formed by rocks, dumped in irregularly, and are not flatter than 2:1 on account of the shallow depth. The next 2,850 feet of this dam (total length of the dam is 5,550 feet) are constructed exclusively of mattresses. The crest, 13 feet wide, and the slopes are covered with heavy rocks (Figs. 11, 14.). The head of this dam has a slope of 10:1, (Fig. 15) The inside slopes are very flat in the upper part, commencing at the crest with 8:1, gradually increasing to 6:1, 4:1 and 2:1. The slopes towards the south jetty are steeper, as strong currents and heavy waves do not occur here. This low training-dam reduces the width of the mouth from 3,020 feet to 2,300 feet, and has contributed effectively to the increase of the tidal-currents. The deposits of sand commenced to decrease a short time after the dam was finished.

The cut through the dunes and damming off of the old mouth of the Maas offer nothing off particular interest. The correction of the lower Maas has many interesting details. The training-works are shown in Fig. 16. They are constructed of loaded fascines and built up to low water level. The river-side slope is comparatively steep, 1:1, the land side-slope is ¼:1 being in a secure position. The mattresses are loaded down with 614 pounds of rock for each 10 square feet. The rip-rap is made of basalt-blocks, weighing 55 to 220 pounds. Above low water a body of earth with rip-rapped slopes (1.5:1 and 1:1) is put up, with a crown 1.64 feet wide; it is covered with a layer of straw pinned down; its top is 0.66 feet above mean high tide. The fascines do not go above low tide, they will therefore not decay. Great settlements are not liable to occur The earth dam put above low water mark is secured on both sides by rows of piles and is very durable.

The spaces between the new and old shore line can be filled up by natural deposits of sediment, or by artificial means, without weakening the effect of the training-works. Several openings are left in the latter to allow the flood-water, charged with sediment, to enter the spaces behind, also for the passage of dredgers Numerous cross dams connect the training-works with the old shore, to prevent the water from rushing too strongly over the dam; they also prevent strong currents back of the new shore line and quiet the water, so that it can deposit its sediment in the lateral basins. During the low tide the currents will be too weak to carry away any of the sediments deposited.

The height of the training works is worth mentioning. The width of the new channel has been determined undoubtedly with the purpose of using the scouring power of the river to deepen the channel at all heights of the water. As the cross-section is sufficiently large for high water, these training works, reaching a little above the mean flood, cannot back up the water to any extent and cannot prevent the high tide from moving undisturbed up stream. If, in course of time the lateral basins are filled up to the mean tide, trees and bushes will soon grow, forming a firm, solid foreland with a permanent protection.

The deepening of the new channel is continued with great energy. During the year 1883 were dredged:

Between the two jetties	460,000	cu. yds.
From the Westgat	260,000	"
" cuts	460,000	"

The total amounts dredged since the beginning of the work to 1883 are:

In the cuts	3,120,000	cu. yds.
" navigable channel	149,000	"
" entrance between the jetties	956,000	"
" Westgat	620,000	"
	4,845,000	

The cubical contents of the whole new entrance below the level of A. P. was in August, 1881, 11,584,300 cubic yards and in August, 1882, 11,968,700 cubic yards, which shows an enlargement of 374,400 cubic yards. The artificial enlargement in 1881-82 amounted to 782,600 cubic yards, which shows a filling in of 408,200 cubic yards. The cubical contents has decreased nearly the same amount in 1880-81, it can therefore be assumed that the yearly deposit of sand at the new mouth will be about 390,000 cubic yards.

The dredged material is mostly dumped into the North sea at a depth of 56 feet. When the weather does not permit this, it is deposited in the basin of the Nieuwer Maas and between the South jetty and the lower training dam. To make these basins available for the purpose, a dam of fascines, with rock covering, was built, connecting the extreme point, of the South jetty with the low training dam. It was built up to low water of loaded mattresses and heavy rocks, and above low water of brushwork with rows of piles and rock protection between them. The dam consists of three parts: 1, a curved section, 342 feet long, with the top at A. P. + 3.94 feet connecting with the South jetty. 2, a straight section, 440 feet long, with top gradually falling from A. P. + 3.94 to A. P. + 0.66 feet. 3 a curved section 285 feet long, with the top at A. P. + 0.66 feet connecting with the low training dam. A railroad track is laid along the center of the dam, resting upon piles and longitudinal, girders. The sea side of the crown is provided with three, the land side with two rows of piles, between them is a layer of regularly laid rocks. The slopes, below low-water are; on the land side 1:1, on the sea side 1.25:1. The cost of the new channel from Rotterdam to the North sea has been so far $8,500,000. The construction of the jetties alone cost $2,375,000, which is about $194.36 per lineal foot. The future correction and improvement of the Maas will cost an additional $5,000,000, so that the total cost of this new channel will be about $13,500,000

Municipal Engineering; Paper No. 3.*

WASHINGTON, D. C.

(*Continued from Page* 116.)

SUPERINTENDENTS of STREETS.

The Superintendents of Streets has charge of all street, alley and sewer repairs, (except the repairing of concrete pavements,) of the cleaning of all unpaved streets and alleys, of the removal of snow from street crossings, and in front of public property, of the cleaning of sewers, and of all new work constructed under the "permit system."

There has been for some years a system in vogue, in this city, known as the permit system, by which parties who want improvements made in advance of the regular estimates, can secure them by the payment of a portion of the expense. On this class of work, whether for pavements or sewers, the city furnishes the material and the property-owners desiring the improvement make a deposit of money sufficient to cover the cost of the labor, which is done under the supervision of the superintendent of streets. This is the usual practice in the pavement of alleys. All work in this department is done by day-labor, except a small amount which is done by a force of men who have been sentenced to the work-house, who are employed in cleaning filthy gutters, alleys, etc.

STREETS.

The streets of Washington all run north and south or east and west. As will be seen by the accompanying map, there are numerous avenues cutting the streets obliquely. The streets as originally laid out, vary from 80 feet in width to 160 feet, and the avenues from 130 feet to 160.

Monuments were originally placed at the intersection of the building lines of the streets. These monuments were blocks of stone roughly dressed so as to give two tolerably even faces adjacent to one corner, which was approximately a right angle. On the two even faces were cut the names of the streets and the number of the squares of which the stone was the corner. The following sketch shows the general form of the stone and its position on the street.

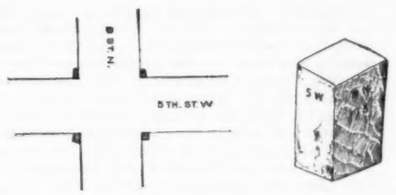

Plate 1a.

These stones were about a foot square, and the marked faces were on the building lines of the respective streets. As buildings were erected and streets graded the monuments were removed, and in most cases no means were taken to perpetuate their position, so that at the present time, the determination of the lines of a street is largely a cut and try process, by assuming all buildings to be correct, and measuring from other streets until a line is found which will agree more or less closely with the recorded maps. The only monuments put in at the present time on surveys within the city limits are nails driven in the sidewalks at certain distances from the building lines. As these nails are not put at any fixed distance, but wherever it is most convenient, they are of no use to any one unless he gets the notes of the city engineer who puts them in.

Within the city limits the original plan of the streets is adhered to, except in some large squares where the property owners have seen fit to open short streets. Where this is done, the property owners must cause a plat to be made and recorded in the office of the City Surveyor, showing the square or squares to be subdivided, the width of the street and the size of the lots. This plat must be certified to by the City Surveyor, the owners of the property, and two competent witnesses. This recorded plat is sufficient to convey title to the streets opened. The Commissioners have made it a rule of late, not to accept as a public street anything less than 50 feet in width that is, they will not grade and pave it at the public expense, but it may be done at the expense of the property owners, and is looked upon somewhat in the light of a private street.

The fiscal year of the District of Columbia begins with July 1st and ends June 30th of the following year. Each year the Commissioners are required by law, to prepare an estimate of the amount of money which will be raised by taxes on the property of the District, and an estimate of the expenses for the next ensuing fiscal year, and present it to the Congress of the United States, at the opening of the session. This estimate must specify what streets are to be improved, and what kind of improvements are to be made, and an annual appropriation is made by Congress in amount equal to the taxes paid on the property of the District. Out of this fund is paid the entire cost of grading, paving, and laying the sidewalks on all streets—except when property owners want improvements in advance of the estimates of the Commissioners, when by their paying the cost of the labor it may be done under the "permit system," as explained under the duties of the Superintendent of Streets.

NAMES OF STREETS.

By referring to the map it will be seen that all streets running east and west are designated by the letters of the alphabet, and

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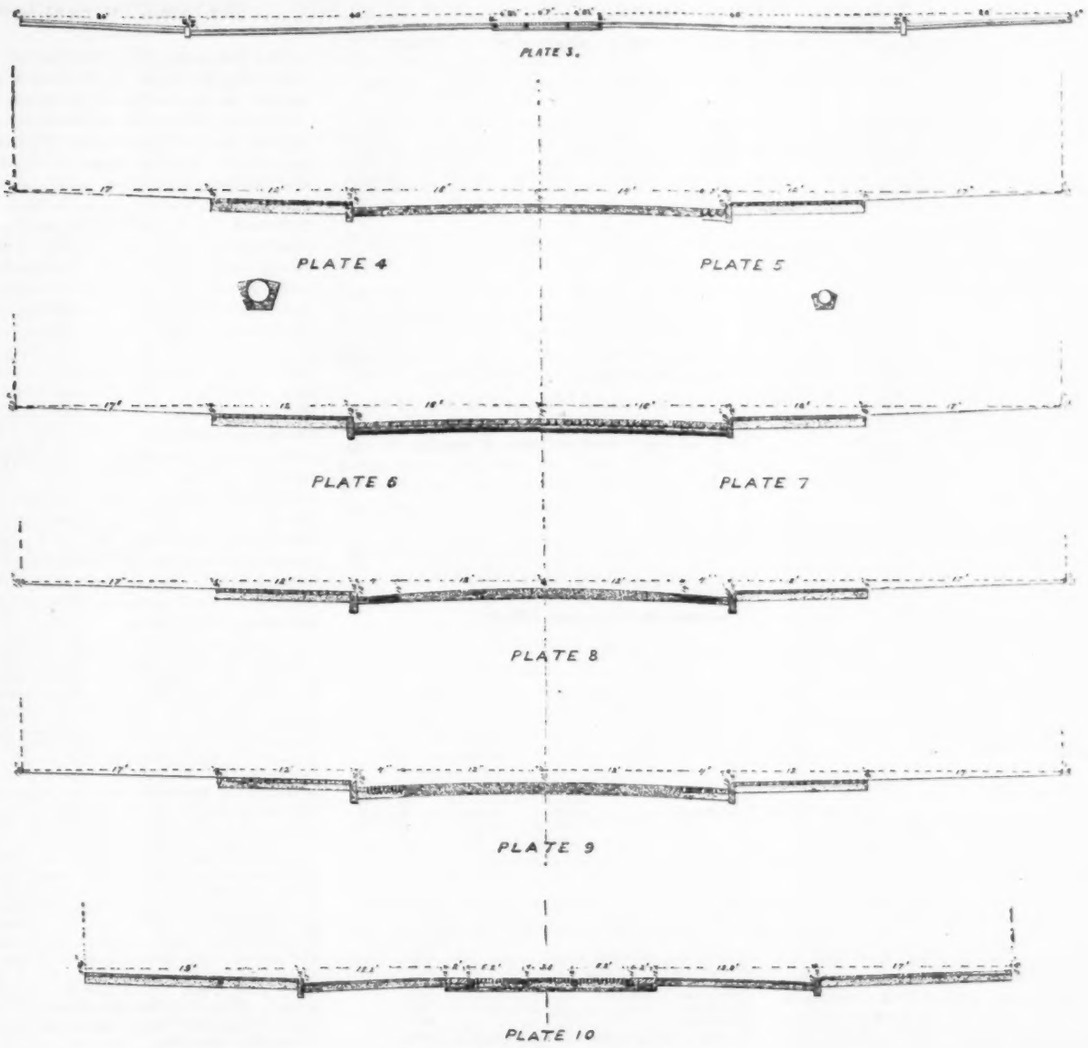


Plates 3-10 Roadway Cross-Sections.

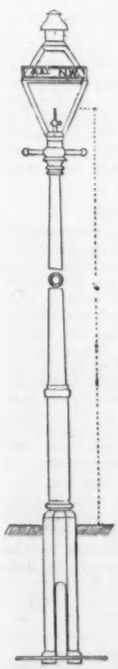


Plate 2.

those running north and south by numbers. The streets running directly north, east, and south from the Capitol are respectively named, North, East, and South Capitol street. The lettered streets begin at a line drawn east, and west through the center of the Capitols and are lettered in both directions, giving two streets for each letter, one north and one south, and are designated as A South, B South, A North, B North. In like manner the numbered streets begin at North Capitol street, and are numbered each way. They are designated as First East, Second East, First West, Second West, etc. Avenues are named after various States. At street crossings there are glass signs on the lamps, giving the names of the streets as shown in (Plate 2.)

The standard cross-sections of streets for different kinds of pavements are shown in Plates 3 to 10. Plate 3, is a cross-section of Pennsylvania Avenue, which has a width of 160 feet between building lines, and 108 feet between curbs, there is a double-track street railway in the middle of the street, leaving a clear carriage-way on either side of 46 feet. The sidewalks 26 feet in width, are paved with brick on the south side, and on the north side with "Granolithic," artificial stone. The curbing is dressed granite 8 inches in thickness, and 24 inches in depth. Adjoining the outside rails of the car-tracks there is a line ofblue stone curbing 4 in. in thickness and 6 in. deep. The carriage-way is paved with sheet asphalt, specifications for which will be given later. The portion between the car-tracks, and between the rails is paved with cobblestones, The top of the street car rails and the pavement adjoining are level with the curbs; the gutters are 6 inches lower. The surface of the roadway is an arc of a circle tangent to a line joining the top of the curbs. The sidewalk has a slope of half an inch to a foot.

Plate 4 is a half section of a street 90 feet between building lines, with a raodway 35 feet in width paved with sheet asphalt; brick sidewalks 12 feet in width, and 17 feet of parking on each side. Plate 5 shows the same, with gutters 2 feet in width, paved with granite blocks. It is found that near the curbs, when there is but little travel, the asphalt becomes porous and rotten, while the portion kept compressed by the wheels of vehicles is still good. To obviate this, gutters paved with granite blocks have been introduced, but as the cost of the granite blocks is greater than asphalt it is not used in all cases. Plate 6 is a half section of a street paved with compressed block asphalt, and Plate 7 the same paved with granite blocks. In each cut the street has a carriage-way 32 feet in width, with sidewalks 12 feet in width, and 17 feet of parking on each side. In Plates 4, 5, 6 and 7 the roadway is an arc of a circle having a rise of 4 inches at the center, with gutters 6 inches below top of curbs. The brick sidewalk has a rise of a quarter of an inch to a foot, and the parking generally a rise of half an inch to a foot. Plate 8 is a section of a graveled street, with cobble gutters. The roadway is 32 feet between curbs, the middle 24 feet, being graveled, leaving gutters 4 feet in width on each side. The graveled portion is an arc of a circle with a rise of 6 inches. The gutters have a line of flagging 12 inches wide and three inches thick laid adjacent to and 6 inches below the top of the curb; outside this is 3 feet of cobble paving, with a slope of 1 inch to a foot to meet the gravel surface. Plate 9 is a section of a macadam roadway 32 feet between curbs, with cobble and flag gutters 4 feet in width. The surface of the roadways is an arc of a circle with a rise of 5 inches, the center being 1 inch below the top of the curbs. In this case the gutters are laid to the same curve as the macadam roadway. Plate 10 is a section of a street 80 feet wide, with two lines

REPLACEMENT OF WOODEN PAVEMENTS.

Years.	With Asphalt.		With Granite.		With Asphalt Blocks.		Total.	
	Square Yards.	Cost.	Square Yards.	Cost.	Square Yards.	Cost.	Square Yards.	Cost.
1878-79	104,023	$200,900.18	56,993	$129,657.32	1,904	$2,661.61	162,100	$333,219.11
1879-80	67,963	104,143.17	45,684	87,390.42	3,214	6,349.51	116,261	197,883.10
1880-81	75,469	146,291.70	47,743	103,678.86	.....	.....	123,212	249,970.56
1881-82	72,624	156,663.71	15,477	42,529.05	4,937	9,318.60	93,038	208,511.36
1882-83	87,111	197,765.19	.....	.....	14,130	31,639.68	101,241	229,404 87
1883-84	87,045	201,261.78	.....	.....	.....	.....	87,045	201,261.78
1884-85	26,870	62,407.26	10,019	26,437.64	.....	.....	36,889	88 844.90
Total	521,105	$1,069,432.99	175,316	$389,693.29	23,375	$49,969.40	719,796	$1,509,095.68

COAL-TAR PAVEMENTS.

	Yards.	Cost.
Laid in 1871-77	741,415	$2,284,004.91
Resurfaced with coal-tar, 1875-78	218,843	329,378.69
Replaced with asphalt, 1879	17,864	29,691.90
Resurfaced with asphalt, 1878-80	53,436	59,187.40
Resurfaced with asphalt, 1880-81	20,451	31,300.48
Resurfaced with asphalt, 1881-82	31,172	45,741.86
Resurfaced with asphalt, 1882-83	19,445	29,682.03
Resurfaced with asphalt, 1883-84	19,427	31,555.55
Resurfaced with asphalt, 1884-85, about	17,000	26,000.00
Total resurfaced	397,638	$ 582,537.81
Minor repairs, 1875-78		3,099.62
Minor repairs, 1878-79		18,618.22
Minor repairs, 1879-80		8,206.26
Minor repairs, 1880-81		23,020.47
Minor repairs, 1881-82		21,759.48
Minor repairs, 1882-83		18,967.04
Minor repairs, 1883-84		12,043.23
Minor repairs, 1884-85		22,000.00
Total for resurfacing and repairs		$710,245.13

NEW IMPROVEMENTS, 1878-85.

Years.	With Asphalt.		With Granite.		With Asphalt Blocks.		Grading and Regulating.		Total.	
	Sq. yards.	Cost.	Sq. yards.	Cost.	Sq. yards.	Cost.	Sq. yards.	Cost.	Sq. yards.	Cost.
1878-79	.....	.....	.....	.....	.....	.....	.....	$11,522.70	.....	$11,522.70
1879-80	.....	.....	.....	.....	.....	.....	.....	55,164.91	.....	55,164.91
1880-81	9,951	$17,228.58	3,110	$ 6,914.68	2,889	$ 7,661.03	.....	10,238.48	15,950	42,042.77
1881-82	8,229	21,243.97	16,687	42,296.11	.....	.....	.....	13,674.68	24,916	77,214 76
1882 83	.....	.....	15,815	48,475.28	.....	.....	.....	7,361.55	15,815	55,836.83
1883-84	34,780	92,4 3.76	11,388	38,168.46	.....	.....	.....	33,672.85	46,168	164,245.07
1884-85	31,802	92,403.76	9,167	33,320.11	11,448	27,440.98	.....	25,133.34	52,417	175,952.36
Total	84,762	$220,934.24	56,167	$169,174.64	14 337	$35,102.01	.....	156,768.51	155,266	$581,979.40

of street railway. The roadway is 40 feet between curbs, with two carriage-ways, respectively 14 feet 2 inches and 15 feet 8 inches in width. The space between the rails and between the tracks is paved with cobble. The carriage-way is paved with sheet asphalt except a space 2 feet in width on each side the car tracks, which is paved with granite block. The top of the rails are laid with the curbs, and the gutters 5 inches below.

There are many different widths of roadway in the city, varying from 25 feet to 108 feet; and the above sections can only be considered as typical forms. The rise is usually made

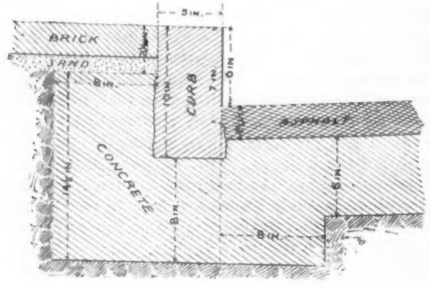


Plate 11.

about the same in proportion to the width, as in the examples given; but on street grades it is made less. Sheet asphalt is not generally used for grades steeper than 4½ feet per hundred. Grades vary from 3 inches per hundred to 14.5 feet per hundred. The curbs on principal streets are dressed granite to 6 inches in thickness and 20 inches deep; on others, bluestone 5 inches in thickness and 20 inches in depth is used. All corners are turned with circular curbs, which usually have a radius of 6 feet. The curb is dressed 12 inches in front and 3 inches on the back, and is chiseled 7 inches in depth on joints.

Since the above was written an order has been issued by Capt. Mahan relating to the style of curb and manner of setting in connection with sheet asphalt and compressed block asphalt pavements; all estimates for future work are to be based upon this last plan.

Plate 11 shows the adopted type in sufficient detail without further explanation.

There are within the city limits 234.35 miles of streets, improved as follows:

Asphalt and concrete	67.44	miles.
Granite and trap block	20.91	"
Wood	0.19	"
Cobble and bluestone	14.72	"
Macadam	6.19	"
Graveled	36.14	"
Unimproved	86.76	"

The following tables, taken from the annual report of Capt. F. V. Greene, assistant to the Engineer Commissioners, for the year ending June 30, 1885, show the expenditures for street work for seven years ending June 30, 1885.

The contract prices for various items of street work for the year ending June 30, 1885, are as follows:

Sheet asphalt paving	$ 2.25	per square yard.
Compound asphalt paving	2.10	" " "
*Granite block	0.71	" " "
Macadam roadway	0.40	" " "
Graveled roadway	0.12	" " "
Cobble gutters	0.15	" " "
Brick sidewalks	12 to 0.25	" " "
*Setting curb	0.16	per lineal foot.
*Laying gutter flag	0.03	" " "
Compound asphalt paving blocks	60.00	per M.
Granite paving blocks	45.00	" "
Paving brick	8.90	" "
Gutter flag	0.19½	per lineal foot.
Granite curb, straight	0.83	" " "
Granite curb, circular	1.37	" " "
Bluestone curb, straight	11.58½	" " "

* Granite blocks, curbing and gutter flag are furnished by the city, but the prices given above include hauling from the property yard

(TO BE CONTINUED).

Pumps.—The Pond Engineering Co., St. Louis, has been awarded the contract for the pumping machinery for the water-works at Sioux Falls, Dak., consisting of a Blake, duplex, pumping engine of 1,000,000 gallons capacity, together with boilers, etc.

The Luiz I. Bridge at Oporto.*

The following is an abstract of a paper by T. Seyrig, Mr. Inst., C. E. in the *Memoires de la Société des Ingènieurs-civils*, Paris, 1886, P. 38.

The river Douro would seem to constitute a fruitful site for the erection of great engineering works. After a lapse of eight years, the first celebrated bridge, with central arch of 528 feet span and of great height, † has been followed by a second example, apparently similar, but really presenting many features of difference when closely examined. Its most notable peculiarity is, that a single arch of 566 feet span provides two seperate passages in the same vertical plane, of which the upper road is at a level of 164 feet above the lower one. This somewhat mars the bold effect of the work, but it serves to solve the somewhat difficult problem of intercommunication between the different levels of the town. The author, who designed both structures, gives a summary of the various plans submitted in competition for the latter bridge, insisting on the propriety of endeavoring in such works to harmonise economy and the exigencies of good construction with pleasing and even artistic aspect. This attention to artistic effect he claims as a characteristic of the French school of engineering.

"The arch of the Luiz I. Bridge is so far the largest existing, and will doubtless remain so until the completion of the Forth Bridge. It weighs with its two roadways about 20 tons per lineal metre of span—6 tons per foot. The arch rests on rollers, and its form is the opposite of that of the earlier bridge; that is to say it is narrowest at the crown, instead of being crescent-shaped. The theoretical considerations which led to this change are discussed at length by the author, but the principal reason was the obligation of allowing the lower roadway to pass between the springings of the arch, while assuring the transmission to the masonry piers of the wind-stresses—that is to say, without interrupting the continuity of the cross-bracing. This difficult condition is asserted to have been satisfactorly met. The width of each roadway is 26 feet 3 inches; the upper road is at a height of 204 feet above the river; it is paved with wood and is laid with a tramway. The lower road is macadamized. The total weight of metal in the structure is about 3200 tons, and its price will amount to nearly £160,000.

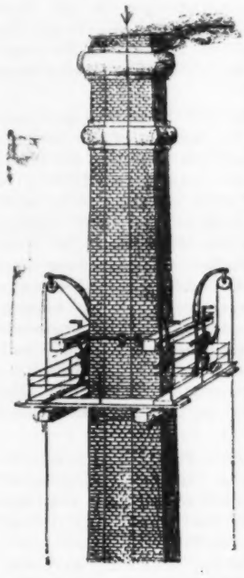
"The most important part of the paper relates to the mode of erection. The author adopted a novel system, consisting in the employment of wire cables, by which the various parts were raised from barges moored in the river below, and assembled in their proper positions by manœuvre excuted entirely from the side piers. This funicular system resulted at once in safety, rapidity, and great economy. The ironwork was constructed at the works of the Société de Willebroeck, and the excellent workmanship conduced greatly to render the erection easy and economical."

MANUAL LABOR AND MACHINERY.—A rough attempt to calculate what is saved or gained to a community by the use of machinery has been made by Mr. C. D. Wright, the Secretary of the United States Bureau of Labor. He calculates that in the industries of the States, steam and water power are used to the extent of 3,400,000 horse-power. Each horse-power he computes as being equal to at least the labor of six men. If, therefore, men were employed to do the work, there would be 21 million of them engaged; and 21 million men would represent for America a population of 105 millions. These industries are now carried on by 4 million persons, representing a population of 20 millions. To do the work accomplished by power, and power machinery, in the various industries, and the railroads of America would require men representing a population of 172 millions in addition to the present population of the country of 55 millions, or a total population of 227½ millions—a population which would be, of course, obliged to subsist upon the present means.

* Abstracts" Institution of Civil Engineers.
† Minutes of Proceedings" Inst C, E. vols. li P. 302; 177.

A Chimney Climber.

The building of chimneys, steeples, monuments and columns of considerable height, their repairs, or taking down, are accomplished always at a large expense and considerable danger. The cost of the staging is a big item in the expenditure. An English inventor has patented a device for overcoming these objections and the American patent is now in market for a buyer. The machine in question is composed simply of a double set of clamps attached to each other by chains and winches. These clamps are used in climbing the chimney, or other structure on the exact principle that a man climbs a pole; he holds on by his hands and arms till he brings up his legs and feet, and then with them as clamps he pushes up his body. To the lower of the two clamps of the chimney climber is attached a platform for the workmen. The apparatus is cheap in construction, simple in application and use, and absolutely safe.



A neat model of the invention can be seen at this office, where also all particulars may be learned from Mr. Arthur D. Westcott, who has the disposal of the patent in America. The machine is now in constant use in England, and our Mr. Stauffer personally saw it in operation in the vicinity of Liverpool in April last. Here is an opportunity for a "live" native to garner in the "millions" which our English cousins see in their invention.

Petroleum as a Motive Power.

(From The London Colliery Guardian.)

At the Royal United Service Institution, recently, a paper was read by Colonel C. E. Stewart, of the Bengal Staff Corps, on the use of petroleum as fuel in steamships and locomotives, based on its employment in the Caspian sea and the Trans-Caspian region.

The lecturer pointed out that great efforts had been made to burn crude petroleum or else astatki, which was the refuse left after the more volatile oils has been distilled off the crude petroleum, and said that in England great ignorance appeared to prevail on the subject. The first efforts in this direction were not successful, but all dificulties had now been overcome, and for the last twelve years astatki had been burnt in most of the steamers running on the Caspian sea or the Volga river. He recommended its use in our service, because it required less room than coal for stowage, and it could be placed in vessels in spaces that could not possibly be available for coal, viz., between the inner and outer bottom of a ship. Besides this, it was cleanly in use, there being no cinders or ashes. It also did away with necessity of a fire crew beyond the necessary number for cleaning the machinery and superintending the steam, a circumstance which any one who had watched stokers at work in the hold of a coal-burning ship in the Red sea would appreciate.

Again, the great facility of loading was an enormous advantage, and the absence of smoke by no means its least good quality. He thought the supply of petroleum was practically inexhaustible, as, in addition to that which could be obtained from Russia, there was an unlimited supply to be obtained from America, Upper Burmah, and the country surrounding the Persian Gulf. He contended that, in case of war, a fast war vessel having on board, say, 1,500 tons of petroleum, could keep at sea for a very long period and do our shipping interest incalculable mischief. She would probably be captured when her supply of petroleum fuel was exhausted, but it would be well worth our enemy's while to lose a ship after all the mischief she could accomplish during the time her supply of fuel was available.

Vessels burning coal would have a very bad chance of capturing her as long as her fuel lasted, as they would require to replenish their supply long before she would require to do so; and it is not certain that she would be helpless when her supply of astatki came to an end, for it would be quite possible, if she could procure a supply of coal, to alter her furnaces in a day or two so as to burn that fuel. There would be great advantge obtained by torpedo-boats burning astatki over torpedo-boats burning coal. In these small vessels a hydrocarbon like astatki—whose steam-generating power is nearly double that of coal—would give the boats using it an immense superiority, to say nothing of the advantage gained by their power of approaching the enemy unseen, in consequence of the almost entire absence of smoke. It should be our object to have a supply of astatki stored for the use of our vessels at different points in the Red and Mediterranean seas and Indian Ocean. If we had large reservoirs containing astatki in Cyprus, at Malta, Gibraltar, Aden, Ceylon, Singapore, and Hong Kong our vessels, both of the mercantile marine and Royal Navy, which need that fuel would have an immense advantage over the ships of any nation burning coal.

Thermometer Scales.*

BY FRED BROOKS, M. AM. SOC. C. E.

Recent events make it desirable to give a little thought to the difference in the scales used to indicate temperature. It is well-known that the scale in popular use in the United States, marks the temperature of melting ice 32 degrees, and that of boiling water 212 degrees; while the scale of scientific men marks those temperatures 0 degrees and 100 degrees respectively. If engineering is a scientific profession, engineers may be expected to prefer the latter scale; but they actually use the former the most. The division of the interval between the fixed points into 100 parts has a superiority over that into 180, if there is any advantage in decimal reckoning. Those remarkable numbers, 212 and 32, have no peculiar thermometric virtue. It is unnecessary to draw a lengthy contrast between the two scales as to intrinsic merit. Charles T. Porter's standard "Treatise on the Richards Steam Engine Indicator," says (p. 39 of third edition) "that the Fahrenheit scale begins in a blunder and ends nowhere." "If the Fahrenheit scale could be at once abolished, and the centigrade scale substituted in its place, we should be rid of an arbitrary nuisance, which is already being banished from the domain of science, and is a real impediment to popular scientific advancement." This sentence suggests inquiry as to what hinders the desired substitution. The Fahrenheit scale cannot be instantaneously driven out of popular use; yet engineers, as they have occasionally to express temperatures, can do it in centigrade degrees, even though in some cases the equivalent Fahrenheit should be added in explanation. Will there ever be a better time than the present for taking this partial step toward the proposed change? Certainly this course is free from obstacles that sometimes stand in the way of similar improvments. For instance, it is regarded as an indispensable preliminary to such changes, to circulate abundant information in advance, and to provide conversion tables, double scales or diagrams. Well, for thermometers that is already done; the books that engineers use are full of tables and formulas for translating from one scale to another. Again men do not buy and sell by the degree of temperature; but the thermometer is a scientific instrument, used mostly by intelligent people. There is not in this case that mass of ignorance to be instructed which there would be in the case of things like time-reckoning or coinage, with which everybody has to do.

National prejudices, though utterly irrelevant, too often interfere, as was noticeable in the recent adoption of a common prime-meridian. Happily, American views of the change now under discussion, cannot be distorted by such prejudices with regard to the countries where these thermometer scales orignated for Holland was the residence of Fahrenheit, who produced one of them in 1720; and Sweden, of Celsius, who devised the other in 1742. With those two countries we have the same grounds of sympathy. Sir Isaac Newton published in 1701 some results he obtained with a linseed-oil thermometer (see Philosophical Transactions No. 270, vii, which is at pp. 824-9 in Vol. 22); and Réaumur, the French naturalist, invented in 1731 a spirit thermometer with the scale which was used for many years in France and elsewhere. They both took 0 degrees to designate the temperature of melting ice, though they designated the boiling point differently from each other, and from either Celsius or Fahrenheit. Most branches of measurement are so connected, that a change cannot be made in one thing without some disturbance of others; thus time is related to angular measure, and coinage to weight. But temperature is independent; it has as little to do with one weight or measure as with another, and people who differ widely in their preferences for a basis of weights and measures should be able to agree upon a thermometric scale. The centigrade scale is used in the meteorological service of Russia, a country which has for length measures the archine and the British foot; of Denmark, which has for length measures the alen and the Rhineland foot; and of the other continental countries of Europe, which have still another length measure. It is also used in places of such minor national rank as the Khedival Observatory in Egypt, and the National Observatory of Mexico.

In England, the latest annual report, dated 27th July, 1885, from the Standards Department of the Board of Trade, drew attention (p. 2) to the fact that various instruments, among which are thermometers, are not directly provided for by the Weights and Measures Act, so that at present the Standards Department has no power to provide standards for them. So the Briton is not prevented by the law from using such a thermometer as he pleases; and the August, 1885, edition of the British Pharmacopœia, an official publication, contains centigrade temperatures throughout, in addition to Fahrenheit temperatures, which alone appeared in former editions. Likewise in the last decennial revision of the United States Pharmacopœia, published in 1882, both

*From Transactions Am. Soc. C. E.; read March 3, 1886.

were inserted. The 309th paragraph of the "Revised Regulations for the Government of the Marine Hospital Service," approved 24th April, 1885, and authorized by Supervising Surgeon-General Hamilton, Secretary Manning and President Cleveland, is as follows:

"In recording thermometric observations, medical officers and acting assistant-surgeons of the Marine Hospital Service will make use of and refer to the centigrade only."

The United States will be among the last of the nations of high civilization to join in the use of the centigrade scale, even if she brings it into use with the utmost possible rapidity.

The subject of thermometer scales concerns engineers as well as other people, and in that respect resembles standard time, in which this Society has taken a very active interest; but there is the following difference: The centigrade scale can be used in engineering reports, experiments, etc., whenever they are made, be it sooner or later; no date for its adoption need be fixed in advance, as was required for simultaneously setting clocks and watches to the standard time.

Municipal and Sanitary Engineering in the City of London.

(*Concluded from page* 123)

WATER SUPPLY.

Neither the City nor any of the vestries forming the governments in London have any proprietory interest in the water supply, it being furnished by companies.

The expenditures for 1885 were as below:

	l.	*s.*	*d*
For urinals	738	6	0
For flushing sewers	58	19	3
For street watering	637	15	3
For washing surfaces of courts and street washing	163	11	6
For drinking fountains	87	17	6
For standpipes in poor neighborhoods	15	0	0
For city mortuary	7	4	0
	1,708	13	6

The area of streets either watered or washed does not appear in any report, but speaking of the snow storm in 1881, it is said to have been 6 inches deep and to have measured about 133,000 cubic yards; this would give about 798,000 square yards or 164.87 acres, making about 38 per cent. of the area of the city in "public ways."

SCAVENGING, DUSTING, REMOVAL OF TRADE REFUSE AND STREET WASHING.

The report on street washing shows such a desirable degree of thoroughness and cleanliness that it is given at length.

The street washing was carried out on the system which has now been in operation for many years, the whole of the carriageways being swept once daily, and the main thoroughfares in wet weather being swept a second time during the day.

In addition to the general cleansing of the whole surface of the city streets, the street orderly system was in operation on the carriageways of all the main thoroughfares, about 150 boys being employed for that purpose. A continuous cleansing of the main thoroughfares therefore takes place throughout the busy hours of the day.

The work of cleansing the main thoroughfares often begins as early as two, three or four o'clock in the morning. The work is then taken up by the street orderlies, and late in the evening, when the weather permits, or the surface conditions render it necessary, the carriageway pavements are washed. The cleansing of the carriageways of the main streets is, therefore, almost continuously going on. The quantity of water used during the twelve months for washing the streets and courts, was about 2,691,515 gallons, the number of nights when water was used at various places was 134.

The footway pavements were swept by the Commission whenever it was necessary; in wet weather those in the main thoroughfares were frequently cleansed with squeegees during the day. It is the obligation of the occupiers of property, to keep the footways clean in front of their premises, although but little attended to by the inhabitants in any part of the city.

The courts and alleys inhabited by the poorer classes, were washed by jet and hose twice a week between July and the end of October.

Here follows a list of places washed nightly throughout the year It may be noted in this connection that the water mentioned would afford only about half an inch on the area calculated above, and the cost of the water is about 30 cents per 1,000 gallons, and apparently a greater quantity of water is used for sprinkling streets than washing them.

When the first compressed asphalte was laid in this city, in 1879, and an attempt was made to wash the dirt from it, the proceeding was promptly stopped, the authorities preferring to have the dirt remain on the street to be blown into their clothes and noses to run any risk of having to clean out catch-basins.

In London the gullies or entrances to the sewers were apparently without catch-basins prior to 1877, but catch-basins have been put in and are emptied once a week by the city scavengers, with the result that they have clean streets. Here the cleanliness of the street is such as results from an occasional heavy rain or the passage of a sweeping machine over the pavements after the dust has been made to adhere to the pavement by the services of a watering-cart.

In 1872 the Commissioners of Sewers determined to clean the sidewalks as the householders apparently could not be depended on to do it, it was "at the same time understood that by doing so the occupiers of premises are not relieved from their legal liability to cleanse the footways," and a notice of these obligations has appeared in every succeeding report, probably to prevent their acquiring a prescriptive right to have their walks cleaned. Not even the employment of orderlies to pick up the droppings of horses and other dirt is as condusive to the comfort of pedestrians as the city cleaning of sidewalks. A gang of men with squeegees pass over the sidewalks and crosswalks during a rain storm, scraping all the fluid mud into the gutters leaving the side and crosswalks clean; instead of following the American practice of keeping the street cleaners carefully under cover, when it is at all damp with the result that the sidewalks are muddy and slippery and the mud is tracked into houses and stores.

It is a pity that our observant young men, who visiting London, study the habits of its inhabitants to such good effect that returning it is difficult to believe they were not born on Cheapside, do not pay some attention to the paving and sanitation of the city, so as to have their influence felt in some other direction than that of trowsers. For we can never have clean streets till we have better pavements, and with a change to pavements like those of London, cleanliness will follow, or with an effort for clean streets, the necessity for smooth pavements will present itself.

The removal of the dust or house refuse seems to present continually growing difficulties, for it is objected that when placed on the edge of the sidewalk chiffioners take the more valuable parts of it and scatter others on the clean streets, a difficulty not unknown in this country.

A discription of the City cleaning and dusting yards at Lett's Wharf, 2,658 yards from Guildehall (which is about the center of the city), will show what is done there. The area is 9,440 square yards with a frontage on the river of 377 feet, and a jetty projecting 98 feet into the river with which the docks allows five barges to lie alongside at once. There are two houses used as residences and offices; stabling for seventy-two horses, divided into four compartments; the space between, "covered with a glass roof so that horses can be groomed at all seasons under cover," also another stable with five loose boxes and means for steaming food and supplying hot and cold water to sick horses, with stove, feed and hay lofts, boiler house and engine for chaff cutting, blacksmith shop, scavengers' mess room, with boxes for clothes, kitchen and chamber heated with pipes from boiler for drying clothes, horse cloths, etc. There is a weigh bridge, a sifting shed for sifting the dust and ashes and rooms for the accommodation of the workpeople in the dust yard, those for the women on one side and for the men on the other, also stores for rags, paper, iron and other materials selected from the dust.

A ten cell distructor with engines and gear for hoisting carts to the top of the furnace (which has a chimney 150 feet high) for burning house and trades refuse, in which 9,196 loads were burned in the last six months, with a 30-horse power engine and three mortar mills for grinding the clinkers produced for "making it into mortar," which mortar does not seem to be salable. Also a three ton crane for removing condemned meat to barges. The official staff consists of a "Superintendent, a Wharf Manager and Salesman, a Wharf Clerk, a Collector of Trade Refuse Accounts, and two Book-keepers." There are also Scavengers, depots at London Wall, and Stoney Lane.

The quantity of refuse removed amounted to 36,177 van loads from premises, and 29,338 of street sweepings, total 65,515, these vans are (as remembered by the writer) very little if any larger than the carts used by the Department of Street Cleaning in this city and hold between 1 and 1¼ cubic yards. Snow seems to be the dreaded occurrance in London street cleaning. From January 18, 1881, until January 6, 1886, there was none. The storms occuring on that date will be the subject of a future report.

The former, above referred to, 6 inches in depth, and amounting to 133,000 cubic yards, was cleared away by the 29th. The maximum force "during any one day and night being 1,718 hands 695 horses and 687 carts." The snow was carted away and thrown into the river from the bridges, deposited in the wider thoroughfare, or on vacant sites. The cost of removal was] £4,254 1*s.* 3*d.* or 15½ cents per cubic yard.

Notwithstanding his limited experience with snow storms the Colonel seems to have, discovered one fact never officially known here viz: that a plentiful application of salt followed by water enough to produce a brine that can readily be swept into the sewers gives the minimum discomfort. The plan of putting sand with a little salt on the streets, as practiced by our horse railroad companies, probably gives the maximum of discomfort, as in cold weather the resultant is a pasty mass, and brine enough to run is not formed unless the weather is quite warm

Gas has been used for removing the snow with the result that 192 cubic feet were burned per cubic yard of snow melted.

The City Cemetery which has an area of 118½ acres and is perhaps with the exception of that at Woking, the largest cemetery in England," is under the charge of the engineer of Comissioners of Sewers, as are also the two chaples one Dissenting and one Episcopal. The number of interments in 1885 was 4902, of which 799 were parishioners.

In 1884 the commission having under consideration the question of providing a Crematorium inspected the process of cremation at Woking, but a bill having been introduced in the House of Commons the Sanitary committee reported against its erection until that mode of disposal had been regulated by Parliament and had its approval.

ARTIZANS AND LABORERS' DWELLINGS IMPROVEMENT ACT.

Under this act land is acquired and dwellings, with stores under them, are erected for renting; this has been under consideration for some time, and after some friction with the Home Secretary has been accomplished.

MISCELLANIOUS.

Under this head is a discussion as to the advisability of constructing "a subway for the use of pedestrians crossig the open space in front of the Mansion House." The consideration of which is placed in abeyance.

"The Mansion House crossing," between the official residence of the Lord Mayor and the Bank of England, on account of its width and the different directions and speed of the traffic crossing it is reported to be the most dangerous street crossing in the world.

It is gratifying to our National pride after having admitted so much superiority in the municipal and sanitary administration of London to note that in 1877 the names of streets where placed experimentally on certain lamps and in 1880 the experiment was continued, the Colonel saying. "Such tablets are, no doubt, convenient in districts when the streets are far apart, street name plates nearly undiscernable at night, the traffic small and the means of inquiry but few, but the conditions in the city of London are, in these respects, entirely different," and in that same year permission was granted to the Post Office authorities to fix fire alarm posts on the public ways "which are connected with the Fire Brigade Stations," and "enable rapid notice to be given of the fires occuring in the city."

The effectiveness of this rapid notice can be judged from the following time table of a fire at St. George's club, Hanover Square, on the evening of December 8th, last:

Alarm of fire	10.05
Arrival of one fire escape	10.13
" " " small hand engine drawn by men	10.14
" " " " " " horses	10.19
" " " " steam " " "	10.20
" " " large " " " "	10.24

The fire went out between the arrival of the fire escape and the first engine.

Colonel Haywood in his reports mentions many patented and other pavements that have been tried in the streets of the city of London, excepting compressed asphalte, wood and granite, they all appear to have been failures, as was also one specimen of the compressed asphalte and some kinds of wood pavements. An American invention, the "Asphalt Block" under the name of the International Pavement, was laid in September 1881, in Queen Victoria street, and in September 1882, "having become very defective" it was removed by the Commission and replaced with dressed stone. Queen Victoria street has a very heavy carriage traffic through it. The granolithic pavement for foot-ways was laid in 1880, and as no further mention is made of it, may be assumed as being successful.

It will be noticed that in most of the environments of city life that add to the health, comfort and productive labor of the inhabitants, particularly in such items as clean, noiseless and well paved streets, the city of London, and we might add the whole metropolis is greatly ahead of the city of New York. We have sent over Commisioners to examine a police organization that cannot control a mob, and a fire department that would let many American built houses burn before getting to the fire; would it not now be in order for this city to send over a Commission to see what a well paved and cleaned city looks like?

Coal Tar Products.

We condense from the *Engineer* the following:

One ton of ordinary gas coal will produce 10,008 cubic feet of gas, 20 to 23 gallons of ammonia water, say 30 pounds; 12 gallons or 140 pounds of coal tar and about three-quarters of a ton of coke.

The destructive distillation of the coal tar will yield:

1. Benzine 1.1 lbs., anniline 1.1 lbs.
2. Toluene 0.9 lb., toluidine 0.77 lb.
3. Phenol 1.5 lbs., aurine 1.2 lbs.
4. Solvent naptha 2.4 lbs.
5. Napthaline 6.3 lbs., napthol 4.75 lbs., naptha yellow, 9.5 lbs.
6. Creosote 17 lbs.
7. Heavy oils, 14 lbs.
8. Anthracine 0.46 lbs., alazarin 2.25 lbs.
9. Pitch 69.6 lbs.

The colors derived from one ton of coal will dye to a full shade.

1. Magusta, 500 yards of flannel 27 inches wide.
2. Napthol, yellow, 3,800 yards, 27 inches wide.
3. Aurin (orange) 120 yards, 27 inches wide.
4. Alizarin (Turkey red) 225 yards of calico, 27 inches wide.

These coal tar colors have not only about extinguished the industries heretofore existing in madder, but have seriously injured that in cochineal and log wood and are threatening indigo.

Its use for perfumery and flavors not only in scenting cheap soaps and counterfeiting the Tonca bean, but for the better class of flavors and perfumes, such as vanilla and the more expensive perfumes that are supposed to be derived like their names directly from flowers, is steadily increasing, and the new industry in quinine that the British government has built up at so much trouble and expense, is seriously threatened by a new coal tar derivation discovered by Fischer, of Munich.

The great triumph so far of the coal tar industry is the new "Saccharine," said to have 280 times as much sweetness in it as cane sugar. This is not, like sugar, a food; it is merely a flavor, prepared from toluene, and is presented as a white crystalline body. So far experiments show no bad effects from its use, which is liable to be extended.

The Noise of New York.

From Texas Siftings.

There is probably more noise in New York City to the square inch than in any other city on the face of the globe, which accounts for the great amount of semi-deafness that prevails. Ask a New Yorker a question, with perhaps the single exception of "What'll you take?" and he almost invariably responds with an interrogative "Hey?" "How?" "How's that?" or some other form to induce you to repeat your question. This does not arise altogether from pre-occupation of mind superinduced by a multitude of calls on the attention, or from an indolent mental condition; it is semi-deafness. The universal hubbub in the city has a most malign influence upon the brain and nervous system, calculated to produce numerous disorders, deafness among the rest. In fact, the celebrated Dr. Hammond says there is more deafness in New York than in any other city he has ever seen. In New York there is no escaping from the noise. With the maddening elevated railroads splitting the city and your ears, and three or four different lines through the whole length of the city; with the universal street cars, trucks, brewery wagons, steam whistles, and the thousand other noise producers out of doors, and the crowded noisy population, with their pianos and their lungs indoors, there is absolutely no escape, no place where the ear and nerves can get repose. The question of noise is a very serious one, and should be looked into by our men of science, and should be legislated for by our city rulers, or it will turn New York into a madhouse.

The Lartigue Railway System.

The inventor is M. Lartigue, a French engineer. The leading feature is that it is a line composed not, as in ordinary railways, of parallel rails, but of a single rail. The system, it is claimed, has been successfully tested and applied since 1883 in several parts of Europe and Africa, notably in Algeria, for the development of esparto cultivation. Above all things, railways constructed on the Lartigue principle are poriable, no slight consideration when they are devoted to military, agricultural, and manufacturing purposes. Dealing first with the construction of the line itself, it may be stated that the rail is supported above the ground by "A" shaped trestles, the upper extremities being bolted to the rail, while the lower rest on the ground and are supported by a sleeper, to which the frame is firmly secured. This is the form of the more rudimentary lines, intended for agricultural and such-like traffic, but on permanent passenger railways guides have been introduced to prevent the swinging of the cars, as well as points, sidings, signals, &c. Both types of single rail line are shown at Westminster. One which is practically on the level, serves principally for experiments, as to speed and to determine the consumption of water and fuel. The other is an irregular line, with curves of as small a radius of 49 feet and gradients as steep as one in 10. The manner in which embankments may be avoided has been illustrated by increasing the height of the trestles in some parts of the line, and there is also a wooden viaduct, taking the place of one of these pieces of heavy work which, on a single line rail, are reduced to their simplest form. The introduction of trestles of different heights suggest a means of avoiding, or at least reducing, embankments, and of crossing ordinary inequalities in the ground, such as ditches, ravines, and brooks. On the more elaborate line the traction is effected by a special steam engine, invented by Mr. Mallet, but any system of haulage can be adopted—animal power, steam electricity, or compressed air, and it is stated that a horse can easily draw about five tons over the Lartigue line, considerable irregularities of level notwithstanding. For general purposes it is sufficient to say that the rolling-stock "straddles" over the elevated central rail, in much the same way that paniers hang down on each side of an animal's back; indeed, M. Lartigue conceived the idea of his railway from seeing a caravan of camels on the horizon, following each other in a long string.

It is intended to lay a line on the system between Listowel and Ballybunion in Ireland, 10 miles, and it is also contemplated to lay a line from a junction with the Great Western to Lynton in Devonshire, 30 miles. The progress of the invention will be watched with sympathetic interest by railway experts in this country.—*Herapath's Journal.*

SOUTH AUSTRALIA AFFAIRS.—The total amount borrowed by South Australia is 19,349,900*l.*, which has been or will be expended as follows:—Railways and tramways, 10,584,228*l.*; waterworks and water conservation, 1,960,850*l.*; harbor improvements, 1,407,313*l.*; telegraphs, 826,030*l.*; sewers and drainage, 668,253*l.*; main roads construction, 1,323,284*l.*; defences and military road, 187,220*l.*; school buildings, 480,800*l.*; other works, 164,625*l.*; aid to revenue (for public works), 100,000*l.*; Northern Territory (including Pine Creek Railway, &c., 1,016,300*l.*), 1,647,300*l.*

The national debt to date amounts to 18,353,300*l.*; representing a proportion of 58*l.* 9*s.* 10½*d.* per head of the population, an annual interest of 763,010*l.*, or 2*l.* 8*s.* 7½*d.* per head.

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We publish this week a double page illustration of the New Channel from Rotterdam to the North Sea and the number is not Complete without it.

GOVERNOR HILL, of this State has acted promptly in approving the dismissal of Rollin M. Squire, from the office of Commissioner of Public Works of New York city; and General John Newton, U. S. A. and present Chief of Engineers, is to succeed him.

This is a new departure with a vengeance, and one that will be very unlikely to meet the approval of the politicians of this municipality. Gen. Newton has all to recommend him to this high office that the honest well-wisher of our city could desire; he is pre-imminent as an engineer with wide experience, is a strictly honorable man and an official thoroughly accustomed to the management of affairs.

But while the man is perhaps the best that could be selected for the position, we only fear that the office itself will not suit General Newton. There is a wide difference between the supreme and unquestioned authority of an army officer, and the petty annoyances, the hounding by office-seekers and the deep plotting of bosses which must assail the man who now undertakes to fill the post of Commissioner of Public Works of the city of New York.

Millions of public money are being expended just now in the New Croton Aqueduct and other public works; and according to recent exposures and well founded charges, some of our wiliest city politicians have all manner of pipe laid for tapping the treasury and diverting the golden stream from honest pockets into their own. These men will, by fair means or foul, put every possible stumbling block in the way of an honest administration of the office of Commissioner of Public Works, an office which is so intimately connected with their affairs.

But as this obstruction policy would hold good whatever good man might fill the place, it is fortunate, after all that we are to have a commissioner who is trained in a military school and is accustomed to deal quickly and sharply with all offenders against square dealing. Any amount of military discipline, firmness of purpose and prompt exercise of power will be required to reform this especial department and snatch it from the men who have long handled it simply as a source from which they could enrich themselves at the city's cost and satisfy personal ambition.

Gen. Newton is a soldier as well as an engineer, and we believe he possesses all the elements to successfully cope with the difficult problem which will be presented to him. But he is somewhat past the prime of life, and it remains yet to be seen whether he can withstand the worry of his office. We wish him every success, at all events, in the interest of better city government.

THE report of the Naval Board of Inspection at New York on our auxiliary navy speaks well for the work of American ship-builders. This board was directed by Secretary Whitney to examine into the availability of vessels of the merchant service as auxiliary cruisers in time of war, and so far they have reported in detail upon two vessels, the *Louisiana*, of the Cromwell line and the *Newport*, of the Pacific Mail Steamship Co., both built by John Roach & Sons. The examination has as yet been confined to the port of New York.

The *Newport* is described in detail as to material, machinery and the minor alterations that would be required to fit her as a cruiser. In point of naval architecture the board classes her as one of the best vessels, American or foreign, that come to New York. She is fitted with every modern invention for increasing safety and speed, is built of the best, heavy plate iron and tripple riveted and with unusual heavy angle-irons. The vessel is 348 feet long, 38½ feet beam, 23¾ feet depth of hold and 2,735 tons displacement. Her engines develop more than one-horse power per registered ton, which is greater than the *Arizona* in proportion to the size of the vessel. She is capable of making sixteen knots per hour on an average, and has a coal capacity sufficient to keep her at sea ninety-four days at a speed of ten knots an hour. Her deck-plan would permit the carrying of six or more 5-inch and 6-inch breech-loading rifles.

The *Louisiana* is also reported as superior to many first-class foreign vessels which are depended upon as auxiliary cruisers.

IN acceptance of a cordial invitation from the Lawrence Water Board, the next meeting of the New England Water Works Association will be held in the city of Lawrence, Mass., on September 15th.

A programme of meeting will be issued by the Secretary later. An interesting and instructive meeting is assured and a full attendance desired. Albert S. Glover, West Newton, Mass., is Secretary.

A QUEENSLAND correspondent of *Engineering*, in writing on the Hawkesbury Bridge controversy, strikes the keynote of American mechanical success when he says that "American machinery *suits the people*, does the work just as well (I won't say better) and takes less to keep in repair"—than the English article of which he has been speaking.

The italics are ours, but in the clause italicised lies the whole secret. While the English manufacturing firms insist upon it that the designs of their fathers are still good enough at home and *must* be good enough for the Colonies for that reason, they forget that the colonists are less conservative and more progressive than the Englishman. And they also are being taught that bad material and flimsy construction, that will not pass inspection at home, will no longer meet the wants nor suit the people of Australia and its neighbors.

The American maker, on the other hand, studies the situation more thoroughly, strives to meet the wants of his clientage, and never content with success attempts to make something better. This has been the history of every tool in the American market from the most complicated in design to the simplest article found in the hands of the mechanic and the agriculturist.

This American characteristic explains our own wonderful advance in the mechanical arts in the last half-century and is a sufficient reason for the preference given to American axes, saws, hoes, etc. even on English soil, and American bridges, locomotives, etc., in the more wide-awake and appreciative Colonies.

IT is told of the early endeavors of Henry O'Reilly, lately deceased, in establishing telegraph lines, that he applied to the United Railroads of New Jersey for permission to set poles and put up a line of wire along their right of way between this city and Philadelphia, and was refused permission on the ground that the telegraph would interfere with travel, by enabling persons to transact business by its means instead of using the railroad. One of the remarkable incidents connected with the introduction of the telegraph was the slowness of railroad men to employ it in running trains; and in 1851 or 1852 an engine driver on the Erie road refused to obey Superintendent Minot in disobedience of the printed time-table regulations, when the Superintendent had telegraphed holding a train that was due.

The Increase of the French Merchantile Navy.

In 1881, the French Government gave a bounty to French built vessels amounting in the case of steamers to 17½ per cent. of the total cost price, and a further subsidy of 1 franc 50 centimes, 28 cents, per net ton for each one-thousand miles run in foreign commerce for French built vessels, and one-half this for foreign built vessels owned in France.

A report of the Commission appointed by the French Chamber to inquire into the working of the bounties and subsidies, reports that since the law came into force, the effect has been so far favorable, that in respect to steamers France now stands second on the list, next to England, their tonnage now being 197,863 in excess of that of this country, and 186,697 tons more than that of Germany. At the beginning of this year, the French merchant navy comprised 895 steamers.

The arrivals and clearances of vessels under the French flag at ports of France have been in 1881, 7,275,000 tons, 1882, 8,608,000 tons; 1883, 8,501,000 tons, 1884, 7,101,000 tons. French vessels now carry 35 per cent. of the national trade with foreign countries.

A Day on the Great Kanawha.

We were coveting the opportunity to get away from the heat, and dirt and noise of the city, when an invitation from Col. Wm. P. Craighill, of the U. S. Engineer Corps, to accompany him on his regular visit of inspection to the Kanawha river improvements, most opportunely arrived. Our appreciation

of the kind courtesy was acknowledged by a prompt acceptance, and on the morning of the 16th we were speeding over the excellent roadbed of the Penna. Central R. R. in the Washington "Limited" express. An hour for sightseeing in Washington was improved by a stroll to the Capitol terrace to enjoy the beautiful landscape therefrom, and especially the sight of the now completed monument to the "father of our country," which is of itself well worth a trip thither to see. Of course we "took in" the innumerable photographic displays of the beautiful and accomplished mistress of the White House, which now constitute the chief attraction of the desolate Pennsylvania avenue.

Leaving New York at 10 A. M. and Washington at 5.30 P. M., the traveler passes over the Washington & Alexandria eight miles thence, over the Virginia Midland to Charlottesville, the seat of the University of Virginia, and thence by the Chesapeake & Ohio to Kanawha Falls to breakfast at 8 o'clock next morning. The route from Washington to Charlottesville is full of historic interest in connection with the late civil war, and as the stations of Manassas, Orange C. H., Rappahannock and Culpepper are reached, memory is very active with the events of a quarter of a century ago which concentrated the eyes of the world and the hopes and fears of a nation, on points which are even yet but insignificant railway stations in the midst of a beautiful,and at intervals a well-cultivated farming region. Humanity is represented mainly in black, and the swarms of pickaninnies in every degree of ragged squalor, but all bright and excessively happy, form the only enlivening feature of the numerous and uninviting stopping places. The railroad line itself seems to be in good hands so far as the maintenance of way is concerned; the roadbed is smooth, the rolling stock better than that of the New York Central, and a high speed is maintained while trains are in motion, numerous and long stops however, interfering with a good final record. There cannot be very much local passenger traffic and its revenue from passengers must grow with the growth of the Huntington system as a through route to the south-west and California. In returning, we came over the line by daylight and felt well rewarded. Trying to sleep on the Chesapeake & Ohio is about as refreshing as shooting Niagara in a barrel, after the latest style. One is always wondering, as he rolls over and back, while he goes whirling around curves, thundering through tunnels and over bridges, and down steep grades, when the limit of adhesion to the rails will be reached, and a possible short cut to eternity be afforded him, until he "gets used to it" and reconciled with the thought that "this is the usual thing," and that these peculiarities of alignment and grade constitute the advertised attractions of the line. In daylight an "observation car" is attached, from which you can see the attractions of a railway through the Alleghanies and the Blue Ridge, and enjoy the beautiful landscape of the Piedmont valley. It is well that there is scenery to enjoy, as there is little else; the eating houses are the same old appetite destroying "hash mills" which are peculiar to certain sections of the "finest country in the world;" the country is a wilderness; the stations of the poorest description, and the majority of people in sight are ragged darkies. But the engineering is something to be proud of, and Mr. H. D. Whitcomb, who is responsible for the line to Huntington, has created a monument to his skill as a civil engineer and his abilities as a constructor. The line is considered unsurpassed in location and construction.

At Kanawha Falls we were joined by Col. Craighill, and a few miles farther on at Coalburg we were met by Mr. A. M. Scott, Assistant Engineer in Charge of all the improvements on the Great Kanawha, Elk, and New rivers under Col. Craighill, and by him were escorted to the United States steam towboat "Bee," Captain and Pilot J. W. Matthews in command, which awaited our coming at this point. The day was one of the hottest of the season, a day indeed noted in the record of hot days throughout the whole country, and the heavy showers of rain which we encountered during the day did not cool the air to an appreciable extent. The river flows through a very picturesque mountain region, covered with forests, broken occasionally by a cleared farm or a coal mining hamlet, but at frequent intervals by the steep tramway up the mountain side to the mine entrance, and the coal "tipples" at the railway, and river bank. At some places also were abandoned saltworks, and one in operation, the trade in this article having been killed by the production at Saginaw. Coal is the great article of traffic in this region, and to enable it to be taken to market cheaply is the leading cause for the improvement of the Great Kanawha.

This river is one of those which the sages of the New York City daily press, and the "funny men" of Congress have recommended to be "macadamized." At ninety miles above its junction with the Ohio river we found a stream wider than the Seine at Paris; than the Scheldt at Antwerp; the Clyde at Glasgow; and the superior of all but two or three of the principal streams of Great Britain.

Throughout the day spent in the interval between Coalburg and a few miles below Charleston, we met numerous steam-tows and two passenger boats; the number of tow boats plying regularly on the river is about seventy-five; how many barges there are we do not know. The standard coal barge of this region is 120 feet long, 25 feet wide, and 8 feet deep; it costs $1,000 to $1,200; its capacity is 500 tons or about 12,000 bushels of coal, under which load it draws 6 to 6½ feet of water. One barge has the carrying capacity of thirty-four freight cars; one steam tow-boat will push from fifty to seventy-five loaded barges, but from eight to eighteen barges is the usual number at a time. The charge for towing coal is from one-sixteenth to one-twentieth of one cent per mile per ton, which includes returning the empty barges. At this low price the number of tow boats is steadily increasing, and the owners are apparently getting satisfactory dividends. The river is divided by nature into a number of pools of considerable length and depth, separated by shoals of gravel and coarse sand, which were the principal obstructions to navigation in low water. Below Charleston the navigation was much better than above, and hence when the improvements were decided upon, it was considered the wiser plan to commence at points which, when improved, would give immediate relief to traffic, rather than to start at the lowest point, and work systematically up stream. This course of proceeding has given rise to a recent charge that the money was spent "where it would do the most good" politically; a visit to the river, and a little observation of the traffic requirements, and the results of the plan adopted will show the error of the newspaper criticism.

The intention is to improve by means of locks and dams ninety-six miles of the river from its junction with the Ohio. Dam No. 1 is farthest from the river mouth; only the site for this has been selected and it is not likely that anything further will be done upon it for some years to come. Dam No. 2 is eighty-four and one-half miles above the mouth of the river and twenty-six and one-half miles above Charleston. This dam is to be stationary and is not yet commenced; the lock is under contract to Chas. H. Strong, formerly City Engineer of Cleveland, Ohio, who has his son now associated with him, and whom we found in charge of the construction. We were shown over the work, and exhibited the drawings, by Assistant Engineer T. Schoonmaker, who has charge of this portion of the improvement. The Inspector of Masonry is J. H. Minnick, formerly Superintendent of Masonry at Fort Carroll, and whose vigilance insures first-class masonry on this work. Dam No. 3 is a stationary dam; both it and the lock are completed, and the latter is in operation. It is twenty-one miles above Charleston. Dam No. 4, fifteen miles, and Dam No. 5, nine miles above Charleston, are both movable Chanoine dams; they are completed, and the locks at both are in operation. We were shown the method of manœuvring the wickets of the weir portion of the dam and the method of dropping them on the Navigable Pass. There is much less time and labor involved than we had supposed, and by means of the full sized models on the bank, one immediately understands the entire construction and method of working of this interesting structure. Dam No. 6, four miles below Charleston, is now under construction; the contractors for foundations and masonry are Harrold and McDonald, of Pittsburg, Pa., and Mr. McDonald was in charge. He is a "pushing" man, judging from the work done already and the way the big stones were being swung into place while we looked on. Heavy, massive work, all of it, built to last, founded so deep in the solid rock and so tied to it, that it may well defy the fiercest freshets of this often turbulent mountain torrent. The same is to be said of the other works; they are founded broad and deep in the solid rock, and it must be nothing short of an earthquake that will loosen them. The Assistant Engineer in Charge here is Mr. Thos. E. Jeffries, and the Inspector is E. H. Kirlin; the lock gates, wickets for dams and all other woodwork, are built under the direction of Mr. Frank Williams. The iron-work contractors of this lock and dam are divided up between the Snead & Co. Iron Works, and Ainslie, Cochran & Co.,—both of Louisville, Ky.

The locks are all 350 feet long by 50 feet wide, in the clear; there are no tolls; the U. S. Government pays for keeping them in order and manning them. Repairs last year on Lock and Dam No. 3, cost $75.06; labor, $1,907.82; on No. 4 they were $120.23 and $1,623.70 respectively; and on No. 5 they were $157.73 and $1,671.02 respectively. Telephone service cost $53.40.

There are thirty-two coal companies shipping coal on the Great Kanawha river and by rail along its navigable distance. The following table shows the development of the traffic:

Shipped	For Year Ending June 30, 1881.	June 30, 1883.	June 30, 1884.	June 30, 1885.
	Bushels.	Bushels.	Bushels.	Bushels.
By rail..	6,631,660	13,290,355	12,059,172	12,972,217
By river	9,628,696	15,370,458	18,421,084	17,812,323
Total..	16,260,356	28,660,713	30,480,456	30,784,540

The amount expended to June 30, 1885, was $1,548,655, and it is estimated that it will need $1,857,590 to complete the improvements.

We have already published a very complete account of the Davis Island Dam and Lock, on the Ohio river below Pittsburg, from the pen of Assistant Engineer William Martin, in charge of the work under Col. Merrill of the U. S. Engineers, for which see page 306, Vol. XV., ENGINEERING NEWS: the movable dams and the locks on the Great

Kanawha are almost identical in construction with those of Davis Island, but on a smaller scale as regards space occupied: we propose to supplement Mr. Martin's valuable paper with one from Mr. A. M. Scott, Chief Assistant Engineer under Col. Craighill, in charge of the Kanawha River Improvements; this paper will not be a repetition of any part of Mr. Martin's but the two papers will together form a most complete description of movable dams as used in American river improvement.

We spent a few hours at Charleston, the capital of West Virginia. It is probably a fair type of a river town of the South; the smells in front of the principal hotel were so positive and persistent that, although quite fatigued from the travel of the two days and the previous night, we preferred to return to White Sulphur Springs for a rest. At 5 o'clock next morning we were escorted to a cottage several hundred yards distant from the main hotel at the White Sulphur where we rested for a few hours, this day and part of thenext was spent in enjoying the lovely scenery in view from the verandahs of the hotel, and in exploring the extensive grounds attached. The season was "at its height" and nearly 2,000 guests were enjoying themselves. They were nearly all from south of Mason and Dixon's line. We were most cordially received by Col. W. P. Smith, a civil engineer, formerly in U. S. Government service, but now "laying off" for a year's enjoyment. Chief Engineers Douglas, of the B. & O. R. R., and Bolton of the Norfolk & Western were guests at the hotel, we were introduced to a lot of Colonels and Judges, all genial, jovial, good looking and companionable gentlemen, whose society we regretted leaving so soon. The train departing from White Sulphur Springs at noon, lands the passengers at Washington at 10 P.M., and at 6 A.M. following, in New York city.

We are under many obligations to Col. Craighill for his kind courtesy in allowing us an opportunity, under such good auspices, to see the practical working of an interesting improvement.

The Eighty-fourth Report of the Philadelphia Water Department.

The report for 1885 of Col. William Ludlow, U. S. A., the late Chief Engineer of the Phildelphia Water Department, is a production containing much meat, and is worthy of speedy, careful and earnest study by the Councils to which it is submitted. This legislative body, however, does not seem to take kindly to advice which would benefit the city alone, if we can judge from the parting shot contained in Col. Ludlow's letter of transmittal. In that document he regrets that his termination of official connection with the city affairs and departure for another field of duty, leaves him without adequate time to formulate certain detailed statements and discussions of matter important to the water service; but the apprehension of a duty unfulfilled is tempered by the consideration that the greater part of his recommendations for the years 1883 and 1884 still remain unacted upon. The retiring chief then concludes "that if the conduct of the affairs in the future shall proceed with the deliberateness which has marked the securing of urgently needed improvements in the past, so protracted a period will be required for their practical execution as to render superfluous any material additions thereto at the present time."

The report itself in dealing with expenditures and receipts puts the general expense account for maintenance of the department only at $534,960.34; and with the service in good condition and appliances in good order, the Chief Engineer estimates that under present circumstances this maintenance account should not exceed $500,000, including the regular annual expenses. This would increase, however, as the city expanded. The expenditure for all purposes, including the balance of large additions to the pumping and distributing plant and repairs, was for 1885 $901,931.49; and the collections for the same year, $1,826,164.04. Contrasting the years 1880-1-2 with 1883-4-5, we have for the first period—expenditures, $1,635,785; collections, $4,510,803, and net revenue, $2,875,017. For the second period we have—expenditures, $2,763,044; collections, $5,245,719, and net revenue, $2,482,674. This shows that while the expenditure during the latter period was 69 per cent. greater than in the first, the net revenue was only 14 per cent. less. In the three last years a new pumping plant of forty-seven and one-half million gallons daily capacity has been added at a cost of $400,000, fifty-four miles of new distributing mains, costing $500,000 more and extensive repairs and improvements to existing plant; or "a total value of $1,127,358.90 at a net cost to the treasury of $392,342.73."

The unusual increase of collections of 1883-4-5 was due to a rapid though, careful reinspection of the entire city; numerous water appliances upon which the assessment for water is based in Philadelphia had been added without the knowledge of or permits from the department and the proper rating of these augmented largely the receipts. As an instance, the water rates to the brewers is two cents on each barrel of product, and some were found paying only 50 per cent. of the proper charges, and one firm was paying for 50,000 kegs when 150,000 were really being made, or $1,000 water-rent instead of $3,000. The report remarks "the sending of a bill for the additional $2,000 occasioned great dissatisfaction in this and similar cases." The chief seems to have also paid particular attention to that well known class in all municipalities, the men having "influence," and doubtless occasioned still further "dissatisfaction."

During the year 1885, 4,985 permits were issued for new buildings, making a total list of premises on the books of 172,633, of which 151,853, or 88 per cent., are supplied with water. The new permits for baths in dwellings numbered 3,857; and for water closets, 4,879, making totals of 80,773 baths and 45,568 water closets. In other words, *about one-half the domiciles in Philadelphia have baths, and more than one-quarter have water closets.* Furthermore, of the 4,985 buildings constructed within the year all but 106 were equipped with closets. This statement speaks volumes for the household conveniences of that city, but also calls loudly for adequate water supply and drainage.

Under the head of "water charges" the chief engineer repeats the argument advanced in his previous report tending to show the advantages of a direct measurement of water supplied to all large consumers and the economical results to the city, and to water takers of the use of meters. Observation and computation both showed in 1883 that a large proportion of the daily pumpage was wasted, thus entailing a heavy unnecessary expense upon the city, and a diminished service to consumers. Meters were introduced in a number of large establishments in the last named year and their record proved the case stated; in some places the amount wasted was largely in excess of that usefully employed as was proven by the rapid decrease in consumption after the introduction of the meters. The reduction was in some cases 50 per cent., and even as high as 70 per cent. The useful qualities of the meter are exhibited in these two directions of restricting waste and equalizing charges, thus benefiting both the city and consumers. In commenting upon his previous report Col. Ludlow states that at a moderate estimate one-third of the water *now* pumped and distributed is still wasted, which means an unnecessary expenditnre for fuel alone in the past year of $30,000, saying nothing of the serious detriment to individual interests by reason of decreased pressures and "scarcity of water."

The main argument advanced against the use of meters was, that the manufacturing interests must be protected against excessive charges, and the effect of the meters would be to increase the charges. To this the Chief Engineer truthfully answers, that the meter is a mere instrument to measure the volume of water passing through it, and that it has nothing to do with regulating the price charged for that water. If the price is too large it can easily be reduced "but in the adjustment of matters of this sort it is essential that it be done 'in the open' and in the general interest, not that of individuals however influential." This doctrine may be revolutionary in the management of city affairs, but it is refreshing at least to see it promulgated in a city document.

Col. Ludlow remarks that he has endeavored to eliminate from the department business this intolerable "personal equation," but he admits that with the present complicated machinery of the city government the task has hitherto proved impracticable. He illustrates the gross inequalities of the "regular" rates by two typical cases; one where a sugar refiner pays $150 taxes, whereas by meter rates he should pay $1,500, and another where two large establishments use the same quantity of water and one pays $4,872 and the other $10,922 per annum for 430,000 gallons per day.

Computation shows that the gross expenditures of the department, excluding interest on loans and plant, would make the cost of the service in Philadelphia nearly 4.75 cents per 1,000 gallons delivered. And on this basis, allowing for needed enlargements. Col. Ludlow thinks that an equitable charge to large manufacturing establishments would be five cents per 1,000 gallons, whereas eight cents is now charged. The effect of this in the last case mentioned above would be to reduce the tax of one party and enlarge it for the other to a rent of $6,825 for each.

Notwithstanding these sound reasons and recommendations, the meters in service have been reduced from 560 in 1884 to 305 in 1885, and they are now only used on premises where there is a mixed supply and the volume cannot otherwise be ascertained. The "personal equation" has evidently still some power.

The daily average quantity of water pumped, in 1885, was 68,945,260, or estimating the population at 947,000, a daily average of 72.8 gallons per head of population. This is a slight decrease in individual consumption over the years since 1881, made in the face of a general increase in supply and pressure, and is clearly due to the detection and repair of leaks and the suppression of the improper use of fixtures.

The report treats fully of the distribution plant and shows that in the best served section of the city (West Philadelphia) there are but five days storage in the reservoir, and in the main city, with a population of 650,000, there are only two days supply on hand. The pipe distribution is defective by reason of small dimensions of the mains, the result of

injudicious restriction of expenditures in past years which forced the department to extend too greatly the use of small mains. Many of the mains too are old and obstructed by tuberculation. About $1,500,000 will be required to complete the work of replacing small and unserviceable pipe. The average cost of pipe in place for the years 1883 4-5 was $3.65 per hundred pounds, a reduction of 17 per cent. over the cost for the three previous years, due partly to the lower cost of material and the considerable quantity of large mains laid lately.

The improvement of the present water supply, (90 per cent. coming from the Schuylkill river,) is treated at length in the report. The many enactments for the prevention of the pollution of the Schuylkill river remained practically dead letters upon the Statute books until last year when, some effort was actually made in this direction, and about 130 nuisances abated in all. Some of the greater evils, long complained of, still exist, however. In this connection an examination was also made of the number of pumps and wells from which other than city water was taken in the built-up portions of the city. The results showed that there were over 1,000 of these pumps, wells, etc., supplying nearly 1,500 premises, of which 1,320 were within reach of the city mains. The Board of Health has ordered these wells taking ground-water within the built-up portions of the city to be abandoned and filled with clean earth.

The application of the aeration process to the water supply of West Philadelphia was interesting. The process was effected by pumping air into the rising main at the pumping station where the intimately commingled air and water passed to the reservoir under a pressure due to the diminished head. The injection of 20 per cent. by volume of atmospheric air into the mains produced a surcharge of oxygen which did not free itself altogether in the open basin but passed through the distributing mains and showed itself at the house faucets. In some cases a freshly drawn goblet of water was as white as milk for a minute or two, the globules snapping off the surface and crowding the sides of the glass. The chemical effect of this aeration, as ascertained by comparing the water at the intake and the upper mouth of the main, was to reduce the Free Ammonia 76 per cent. the Albumonious Ammonia 40 per cent., and eliminate the Nitrous Acid, diminish the total solids and increase the total gases 22 per cent. It's introduction, however, at all stations is impossible without special and expensive provisions to prevent damage to weak or badly laid pipe and to provide against an accumulation of air at summits.

The report of Col. Ludlow is acompanied by a clear and careful progress report on the future water supply of Philadelphia by Rudolph Hering, C. E., the Engineer-in-charge, and now Chief Engineer of the Chicago Sewerage Commission. With this report are maps showing all the water-sheds available for the future supply of Philadelphia, their drainage areas, densities and distribution of population, etc. We have before referred to the careful and intelligent manner in which Mr. Hering has been conducting this very useful work and the vast amount of information which has been obtained at, what the Chief Engineer of the department characterizes as, "an extremely reasonable cost." Mr. Hering's work is now practically completed as far as the field work is concerned. The hydrographic investigations included rainfall observations and the gauging of streams including the Delaware and Lehigh rivers; and the topographical work embraces complete maps of the various water-sheds and the numerous projected lines for acqueducts and their profiles. In fact, the city of Philadelphia is now in possession of all the necessary data for the discussion, planing and execution of a new and adequate water supply: action by the city authorities alone is wanting. The report of Mr. Hering is too elaborate to be more than referred to here, but it is full of valuable statistical matter and deductions therefrom, and will serve as a model for similar investigation.

Taking this report of the Philadelphia Water Department for 1885 as a whole it is an exceedingly valuable document, both from the vast amount of detailed and useful information contained in it, and the clear statement of facts and fearless expression of opinions. Col. Ludlow is unsparing in his remarks to the authorities of his city and expresses a hope that the "future Philadelphia will better understand her actual rank among modern communities," and adhere less strongly to "a muddy and befouled water supply, the retention of cobble-stone pavements, indifference to a proper system of sewerage, etc." In his concluding remarks he details his experience in attempting to separate the Water Department from politics, and manage it in the best interests of the citizens alone. His views of how this public service should be performed are logical and sound, and under a brief change of heart among the then Councils of Philadelphia he was enabled to do much excellent work; but, as he says, "the regular political machinery has again resumed full control," and things are evidently much as they were.

Rounding and Canting Corners of London Streets.

In our last week's notice of Municipal and Sanitary Engineering in the City of London, reference was made to the method of rounding and canting street corners in that city. The accompanying cut was intended for that issue but its appearance was prevented by an accident.

The cut shows the two usual methods of easing the traffic at the corners of blocks where the travel is great. Experience has

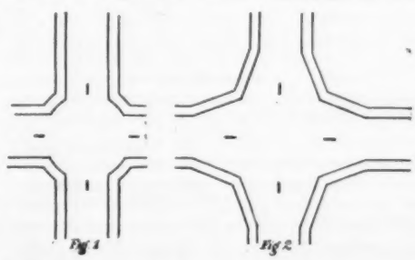

Fig 1 Fig 2

proven their value, and, as before mentioned, the opportunity for architectural effect is much enhanced.

The "refuges," shown on the plans in the middle of the streets, are also of great value in the regulation of traffic. These refuges are intended for the use and protection of pedestrians crossing the streets; they are usually 3 to 4 feet wide and about 12 feet long, and are elevated above the street surface to the same height as the sidewalks. A stout curb borders this elevated space and in the center is generally an ornamental lamp-post, indicating its position, and carrying a sign which commands drivers of all classes of wheeled vehicles to "KEEP TO THE LEFT," as the English law directs. This dividing of the thread of travel is of service to both classes of traffic and is a scheme that could be well adopted in some of our American thoroughfares.

Progress on the Forth Bridge.

On the occasion of a recent personal visit to the Forth Bridge, we found the present condition of this work to be about as follows:

Commencing at the Queensferry side, out of the ten 168-feet approach spans, numbers 3 to 9 inclusive were erected and were lifted 50 feet above datum, having 93 feet yet to go. On the Fife side the five spans are erected, and have to be yet lifted 50 feet. Of the three main piers for the cantilever spans, the piers proper are entirely completed, the bed-plates and skewbacks for the arches practically in place, and from 50 feet to 70 feet of the main arch-tubes already started.

Of the 42,000 tons of steel required for the cantilever portion of this structure, about one-half is now on the ground and is being shaped, fitted and drilled in the works at the bridge site.

The erection of this remarkable bridge, with its two main-spans of 1,710 feet, has in it many features of paramount interest to the engineer. The finished length of the bridge will be 8,091 feet, of which 5,330 feet is taken up by two complete cantilever spans of 1,710 each, two half-spans of 680 feet each, two pier-spaces of 145 feet each, and a central pier of 260 feet. The elevation of the highest pier-member will be 350 feet above high-water, and the elevation at the center of each of the main spans gives a clear headway of 150 feet for vessels.

The approach viaduct was erected on comparatively low false-works and is now being lifted by an ingenious arrangement of hydraulic jacks as the piers are built up; as will be seen from the above report, this viaduct is still from 50 to 93 feet below its finished level. The masonry in this, as in all other portions of the structure, is of the best possible character, and every precaution is taken by means of well-railed platforms, etc., to insure the protection of the workmen. All the material used in pier construction, is lifted by an elevator running on wire-rope guides and is run out on tracks supported on the lower chords of the viaduct spans to the point where it is required. The power used in running out the cars is furnished by Shetland ponies, which when off duty are housed in stables about the size of dog-kennels located within the spans. The stone is set upon the piers by a traveller attached to the top-chord of the bridge, and operated by power transmitted from a centrally located engine through hemp-rope driving-gear.

The shaping of the huge steel plates required in the main-tubes of the cantilever (12 feet in diameter) and the methods adopted for fitting and drilling the assembled plates have already been described and illustrated in this journal. But the lifting of these plates into final position on the bridge, and the riveting in place, is a piece of work that has called for the devising and construction of special erecting plant by Mr. Arrol, of Messrs. Tancred, Arrol & Co., contractors, who has charge of all this portion of the work.

To better understand the character of the problem so successfully solved by Mr. Arrol, we should explain that the cantilevers, when complete, will be 343 deep over the piers, and the bottom members of each span consist of a pair of built steel tubes tapering from 12 feet to 5 feet in diameter, with a thickness of plate at the bottom of 1¼ inches. These tubes are spaced 120 feet apart across the pier at their base, and the skewbacks of balancing spans are 145 feet apart longitudinally in the two end piers, and 260 feet apart in the central, or Inchgarvie, pier. The piers themselves are made up of a group of four cylindrical piers each 60 feet in diameter, spaced, as shown above, 120 feet between centers transversely, and 145, or 260 feet, longitudinally.

To handle the material, Mr. Arrol has de-

vised a working platform of plate and truss girders which rests upon powerful hydraulic jacks, located in each of what may be called the four main pier posts. These girders pass directly through these cylindrical posts so as to furnish an outside platform support as well, and the post plates are only temporarily bolted together in the path of the vertical lift of the girders. On the platform the men can work in safety, all hoisting being done by engines located on the pier itself, and all placing of material being accomplished by travellers on the movable platform.

The riveting of the plates when assembled in place will be done by specially devised mandrils and hydraulic riveters which we intend to illustrate and describe in a later issue. A maximum of 800 rivets per day, it is expected can be put in in one day, though of course circumstances will after this tally greatly.

Bold as is the design for this great bridge and huge as are its proportions, the many ingenious devices here used for manufacturing and handling the material, command almost more respect than the finished structure. The unprecedented dimensions of the spans and members have taxed both engineers and contractors to the utmost; and they have met the demands upon their technical and inventive talent in a manner that must be satisfactory to themselves, and is certainly interesting and instructive to their brother engineers.

We would here gratefully acknowledge the courtesies extended to this journal by Sir John Fowler and Mr. Baker, the Engineers; by Mr. Cooper, the Engineer-in-Charge, and by Mr. Arrol, the contractor, on the occasion of our very hurried but gratifying inspection of the works.

The Panama Canal

The success of the late loan called for by Mr. de Lesseps must have exceeded the most sanguine expectations of this most sanguine of men. The total number of subscribers to the new loan was said to be over $100,000.

Mr. de Lessps still stoutly affirms that the Panama Canal will be completed by July, 1889. The realization of this hope will certainly require rapid work; but it can be said that the amount of excavation is increasing in an encouraging ratio. In 1881 the average monthly excavation was 16,245 cu. m.; in 1883 it was 215,300; in 1884 it rose to 617,054 and 658,708 cu. m. for 1885. Within this year however more powerful machinery has been put to work and for the six months ending June 30, 1886, the average cube extracted per month was 1,079,737 cu. m.

Encouraging as the above figures are, Mr. de Lesseps, in figuring upon 1889 as the year of completion, relies upon an extraction of 2,000,000 cu. m. per month in 1887, and 3,000,000 in 1888 and the first half of 1889. So that correspondingly great advances on the present output must be secured in the very near future.

The question of ultimate cost of the canal seems however still questionable. In December, 1885, very nearly $100,000,000 had been expended and about one-sixth of the total cube extracted. Mr. de Lesseps now estimates a further expenditure of $120,000,000; making all due allowance for enormous preliminary expenses and the cheapening of work by the reason of the instalation of adequate plant, one and one-fifth times the cost of the one-sixth done seems a rather meagre allowance for the execution of the remaining five-sixths.

However, the same sanguine temperment that conceived and completed the Suez canal in the face of most formidable individual and national opposition, is evidently backed by a most enthusiastic army of French shareholders; and if life is spared to de Lesseps and his estimates of quantities hold out for next year the financial world may be inclined to look more favorably upon this collosal undertaking, and even more money be advanced on more liberal terms from the company standpoint.

The latest rumor from France has it, that the actual amount of subscriptions to the Panama bonds, falls short by 42,000 of the 500,000 offered. We cannot vouch for the truth of this statement, especially as it comes through a channel not very freindly to the de Lesseps Panama Canal scheme,

Cost of Brickmaking in England.

From a late paper by Henry Ward read before the Institution of Civil Engineers, we make the following extracts relating to cost of production in England:

In the first table given below the clay was prepared by machinery and the bricks moulded by hand and burnt in clamps according to the usual London practice. The chalk is worked or ground to a thin paste and added to the extent of 10 to 15 per cent., by volume to the washed earth mainly for the superior color it gives to stock-bricks; though it also acts as a flux or binding material when very sandy loam is used, and without it the manufacture of bricks would be impossible from such earths.

Table No. 1.

Cost of Brickmaking in the Sittingbourne, Cowley and Southall Districts; per 1,000 bricks made.

	PER 1,000 BRICKS.	
	Sittingbourne.	Cowley & Southall.
	s. d.	£ s. d.
Washing and wheeling earth	1 6	0 1 4
Ashes and breeze and wheeling on	2 6	0 2 9
Chalk	0 9	0 1 6
Moulding	4 6	0 4 10
Setting	2 0	0 2 1
Skintling	0 3	0 0 3
Engine, etc., pugging, including fuel and stores	1 0	0 0 9
Sand	0 6	0 0 9
Sorting	0 9	0 1 0
Waste	1 0	0 0 9
Wear and tear, tools and plant	1 6	0 1 3
Foreman	0 6	0 0 7
Rent, taxes and rates	0 6	0 0 6
Royalty	2 0	0 2 0
Total	19 3	1 0 4

Table No. 2.

Cost of Making Plastic Bricks per 1,000 for One Year in Yorkshire.

	PER 1,000 BRICKS.	
	Summer, April to Sept.	Winter, Oct. to March.
	s. d.	£. s. d.
Wages	9 9¾	0 10 3¾
Oil and grease	1 4¼	0 1 8¾
Coals	2 3	0 4 7
Rates and taxes	0 1	0 0 1
Repairs	0 6	0 0 8
Land (freehold)	1 5½	0 1 6
Interest	1 2	0 1 4¼
Depreciation	0 9	0 0 9
Average each half-year	17 4½	1 0 11¾

These Yorkshire bricks were dried in the open air during the summer; but in drying sheds heated by fires in the winter. The amount of coal used per 1,000 bricks burnt,—was, in the Hoffman kiln, 3 cwt.; in the drying shed, per 1,000 bricks dried, 4¾ cwt. The cost of coal, on the premises, was as follows: engine coal, 16*s.* per ton; slack for drying shed, 6*s.* 6*d.*; slack for kiln, 6*s.* 10*d.* per ton.

PERSONAL

DENNIS GOUIN, Canadian Government Engineer, is now at work with a force of nine men surveying the rapids at St. Andrew's, Man., with a view of building a lock there, if considered practicable.

D. LAWLER SMITH, ex-Deputy Commissioner of Public Works, New York, and late assistant engineer of the Croton Aqueduct Bureau, has been removed by Commissioner Squire.

W. H. EICHELBERGER, of Baltimore, is Engineer in charge of the preliminary surveys of the Baltimore & Eastern Shore R. R.

ELI WHITNEY BLAKE, the inventor of the widely used stone crusher which bears his name, died at his home in New Haven, Conn., August 16th, at the age of 91.

O. D. HOFFMAN is Chief Engineer of the Minneapolis & Pacific R. R. Co., with headquarters in Minneapolis, Minn.

JOHN BURT, one of the pioneers of Michigan, died on the 16th, at Detroit, Mich. He was born in Corning, N. Y., in 1813 and removed to Michigan at the age of 10, settling at Mount Vernon, Macomb county. His father was Judge William A. Burt, inventor of the solar compass. Judge Burt at an early day turned his attention to the development of the upper Peninsula mining region, and to a large portion of the original surveys of all the great iron and copper mineral districts of the Lake Superior country is attached the name of Burt, either father or son. These original surveys of the family embraced not only the Marquette iron district, but also the Menominee, the Felch, the newly-developed Gogebic, and the great copper bearing ranges as well. John Burt platted what is now the business and residence portion of the city of Marquette, as well as Ishpeming. He suggested the building of the St. Mary's Falls Ship Canal and was its first superintendent, and was the originator and original president of the first railroad projected under the land-grant for the canal, and was closely identified with all the great interests of the mining region.

I SAW a letter recently that told in a pleasant and breezy way of the experiences of three or four Eastern boys who are seeking their fortunes away out West in the rocky fortresses of Arizona. Stage robbers and mining camp humor, lynch law, merry fiddling, and sport with the rod and gun incomparable—these were features that figured in the letter's text. Randolph Adams, who graduated at the head of his class at Columbia School of Mines three years ago, Robert Peele, Jr., a New York boy who was his classmate, with a son of Prof. Blake, of Yale, they are three of the fortune seekers. They went out west with nice soft hands; they carried kid gloves and sported canes—distinguishing features that are not to be found in their wardrobes now. But for young men, no one of whom is yet twenty-four years old, they are doing handsomely, the absence of gloves and canes notwithstanding. They are in charge of important work at the camp of the Silver King Mining Company.

In camp with them are 200 or more miners, strange fellows who have drifted in from everywhere and most of whom have tramped all over the whole globe. They sing, they spin yarns, they drink—the miners—and have a general good time after their own fashion in off hours. And the three Eastern boys who have been pu down in the center of this motley group in places o trust and consequence are getting views of life that the effete East could never have offered them. Yet in the hardships of the far away camp in the rocks the young men are managing to have a very happy sort of a life without participating in the coarser revelry of the ore diggers. The trio have a house of their own; Adams is a violinist, of whom Columbia was proud; Peele is a piano artist, and Blake—was there ever a Yale man who could'nt sing? And away up among the rock s they have their fiddle, their piano, and the gentle strains of "Bingo" and "The Son of a Gambolier.' They are not only prospering; they are getting fat, too. —New York *Times*.

CORRESPONDENCE.

Magnetic Variations.

SYRACUSE, August 16, 1886.

EDITOR ENGINEERING NEWS:

Referring to inquiry of correspondent at Mount Carbon, W. Va., on page 104 of last issue of ENGINEERING NEWS. In Report of U. S. Court and Geodetic Survey for 1882, at pages 315, 316 and 317, we will find the magnetic declination at quite a number of stations in Virginia and West Virginia, reduced to January 1, 1885. Among these is Charleston, W. Va., a short distance west of the inquirer, where it is given + 1° 18′ (east), an increase of 0° 15′ in 3⅓ years.

A note addressed to Chas. A. Schott, Assistant U. S C. & G. S. would undoubtedly elicit further data.

Very truly yours,
H. W. CLARKE.

The Odors of Paris.

With the first few days of hot weather the annual wail has gone up in Paris against the intolerable emanations which appear indigenous to the gay but unhygienic capital. The "full seven and twenty stenches, all well defined, and several stinks" of Coleridge, may all be recognized and classified under favorable circumstances in the French metropolis; and even the natives, *blasè* though they must be towards olfactory inconveniences, are fain to articulate a complaint. The causes of the "bouquet" are by no means agreed upon. By some they are attributed to the fermentation of the material stored up in the 80,000 cesspools of Paris, while others ascribe them to the sewage farms, which are established outside the city. No doubt can exist, however, that the former are largely responsible for the nuisance.

Anyone who has chanced to pass along a street where one of these cesspools is being pumped out by steam—and no one can be much about at night without tripping over the tubes of half a dozen—can bear witness to the insupportable stench with which they infect a considerable area—a stench so powerful that it produces a feeling of asphyxia in the unlucky individual who unsuspectingly inhales it, and which requires a cigar and sometimes even a *bock*, to overcome the fœtid taste and smell. Now and again the pipes burst under the pressure, and then a whole quarter is rendered impassible, except with a nose firmly pinched and a handkerchief to the mouth.

Apart from these constitutional stinks every French house contains its own little collection of disagreeable effluvia, and this remark applies just as much to the best as to the worst houses. Even where the so-called "water-closets" are kept tolerably clean, in apartments, by the aid of a few drops of water, and a brush at the end of a stick, those at the top of the houses for the servants, and those at the bottom for stable men, are invariably in as filthy a condition as disgusting personal habits and studied neglect can make them. The *concierge* is responsible for their maintenance in a state of cleanliness; and he is not likely to do his duty conscientiously, seeing that when, under great pressure, he pays them a visit with a pail and a broom, it necessitates the ingurgitation of several *gouttes* to remove the souvenir of his exploit.

The owners and occupiers appear to treat the matter with the most utter contempt and indifference, although this is indicative of a shortsightedness which would disgrace a navvy. The fact is Frenchmen look upon Hygiene as a theory to be admitted and discoursed upon, but not carried into practice. They keep their streets tolerably neat and clean, and relegate their filth to the interior of their dwellings, where only the privileged get a glimpse of it. It may be thought that these strictures are too severe, but no one who has lived in *maisons meublées*, or in unfurnished apartments, would question their justice or their accuracy. It would be difficult to find a house, even in the Avenue des Champs Elysées, where a "water-closet," in the English sense of the term, exists, unless perchance it has been inhabited by an Englishman or an American, whose first care is to re-model these conveniences in accordance with Anglo-American ideas of what is right and wrong.

As long as the scientific facts are ignored by the authorities, and by individuals, little can be done to prevent the tendency of Parisian atmosphere to *puer et tuer*; and, until the faculties of medicine in France have used the weight of their influence for the better observance of the precepts of sanitary science, they must lie under the accusation of culpable indifference to the public health, which is seriously menaced by the neglect of the most elementary principles. Another smart outbreak of cholera may, perhaps, contribute to the proper appreciation, although the relative mortality from typhoid fever in Paris and in London, with twice the population, should long since have sufficed to direct attention to the necessity for vigorous and efficient interference.—*British Medical Journal.*

Action of Briny Water Upon Metals.

The experiments made by Mr. Thomas Andrews upon pieces of iron and steel immersed at the mouths of rivers, where the fresh and salt water commingle, demonstrates the fact that the iron is oxydised more rapidly in such a situation than when plunged in seawater only.

The experimenter found that the corrosive action was from 15 to 50 per cent. greater, according to the metal, than when exposed to pure sea-water alone. Mr. Andrews attributes this result to a galvanic action due to a difference of potential produced by the mingling of the waters.

The Witham New Sea Channel.

The Witham new sea channel, recently completed into the estuary of the Wash, is one of the largest and most important works in river engineering carried out in England. The new channel is three miles in length, and compared with the Suez Canal, the Amsterdam Canal, and the proposed Manchester Ship Canal, the width and depth is as follows: Suez Canal, depth 26 feet, bottom width, 72 feet; Amsterdam Canal, depth 23 feet, bottom width, 89 feet; Manchester Canal, depth, 26 feet, bottom width, 120 feet; Witham new channel, depth, 27 feet, bottom width, 130 feet. Prior to the construction of the new channel thousands of acres of land in Lincolnshire, drained by the Witham outfall, were flooded during periods of heavy rainfall, and vessels of only 300 tons could reach the port of Boston. Now vessels of 2,000 tons frequent the port, which bids fair to become one of the most important on the east coast, and the depression already acquired in the low water level at Hobhole is 4 feet, whilst the drainage sills of the grand sluice are dry at low water. This depression in the low water level, so beneficial both to the drainage and navigation, is being gradually increased by the natural scour due to the new channel, and the dredging of the hard and unyielding bars in the upper reach of the river. The new channel for about two-thirds of its length was excavated within the shelter of tidal embankments by aid of barrow and wagon roads, and three powerful steam navvies, advancing in echélon, attended by eight locomotives, whilst the tidal or exposed section of the work was executed by training walls and dredging. The strata cut through consisted chiefly of silt, peat, and blue clay, and the bottom or lower portion of the channel for the greater part of its length was formed in the boulder clay. The channel has a fall of 1 foot per mile seaward, with side slopes of 4½ and 4 to 1. Fascines and cliff stone have been used for the protection of the slopes where found necessary. The old circuitous channel was untrained and broken through a mass of shifting sands, and its permanent closing formed a most difficult element in the scheme, but was successfully accomplished in August, 1884. Since then the new channel has been largely used, to the great advantage of both the drainage and navigation. The works were designed and carried out for the Witham Outfall Board, by Mr. J. Evelyn Williams, M. Inst. C. E., and the contractor was Mr. Thomas Monk, of Liverpool. In continuation inland of the improvement of the outfall, the grand sluice has been enlarged, and the Witham widened and dredged for a reach of twelve miles above sluice, the aggregate cost of the works being about £200,000.—*Industries.*

WATER

STAFFORD SPRINGS, CONN., is having a gravity system of water supply built. Water from Roaring brook, five miles distance. 3,000 people. Goodhue & Birnie, contractors.

CALAIS, ME.—The George F. Blake Manufacturing Company has completed a duplex, compound, condensing, pumping engine of 2,000,000 gallons capacity for the Calais Water Company.

LOCKPORT, N. Y.—The Lockport Water Supply Company is sending out the prospectus of its project for bringing water for power and supply purposes from the Niagara river to Lockport in tunnel and open conduit. President, John Hodge; Secretary, Charles Whitmore.

MERCHANTVILLE, N. J.—Messrs. Howard Murphy and Isaac Cassin, civil engineers, have made a report to the Merchantville Water Company with regard to the water supply projected for that city. It is proposed to erect pumping machinery with a capacity of 500 000 gallons, drawing the supply from Pensauken creek.

BATH, ME.—The parties to whom the franchise for building water works for the city was granted, were unable to file the $50,000 bond required of them, and the city is now desirous of entering into a contract with other parties.

GREELEY, COL.—The Greeley Artesian Water Company has been organized to furnish a supply of water for fire purposes from an artesian well. J. M. Wallace is President, and L. W. Hooper, Secretary.

MATTOON, ILL.—Natural gas has been struck at Mattoon. Workmen employed by the Peoria, Decatur & Evansville Railroad Company were employed digging a well, and at a depth of 78 feet the gas was discovered. Pipes were immediately connected, and soon a number of jets were burning. Much excitement has been caused by the find.

EAST ST. LOUIS, ILL.—The Board of City Drainage Commissioners met at the office of City Engineer George W. Locke recently, and organized for business, determining to drain the city at all hazards, even if they had to perform their portion of the work gratuitously.

BRISTOL, N. H.—Water-works are under construction The supply is New Found lake, and may be considered as unexcelled in purity by any water supply in the world. The town pays $900 per annum for hydrants, twenty in number. Goodhue & Birnie, of Springfield, Mass., are the contractors.

OVERFLOW FROM SEWERS.—Complaint is constantly made of damages caused by the overflow from sewers at Newark, N. J., and the responsibility of the city is called in question. In Johnson v. District of Columbia, United States Supreme Court, April 19, 1886, the Supreme Court defines the distinction between the judicial and administrative duties of municipal corporations with reference to their liability for damages to individuals. The action was brought against a municipality to recover damages for injuries done by an overflow from a sewer, and the question was, whether evidence could be admitted to show that the plan upon which the sewer had been constructed by the authorities had not been judiciously selected. It was held that it was not admissible.

Gray, J., said: The duties of the municipal authorities, in adopting a general plan of drainage, and determining when and where sewers shall be built, of what size and at what level, are of a quasi judicial nature, involving the exercise of deliberate judgment and large discretion, and depending upon considerations affecting the public health and general convenience throughout an extensive territory; and the exercise of such judgment and discretion in the selection and adoption of the general plan or system of drainage is not subject to revision by a court or jury, in a private action for not sufficiently draining a particular lot of land. But the construction and repair of sewers, according to the general plan so adopted, are simply ministerial duties, and for any negligence in so constructing a sewer, or keeping it in repair, the municipality which has constructed and owns the sewer, may be sued by a person whose property is thereby injured. The principal decisions upon the subject are collected in the briefs of counsel, and generally, if not uniformly, support these propositions.

CARLYLE, ILL.—The water-works subject was discussed with much animation at a recent meeting of the City Council.

RALEIGH, N. C.—On the 10th inst., the water-works committee received bids from the following parties to build water-works under a twenty years franchise from the city:

A. H. Howland, Boston, Mass.; Turner, Dillaway & Rawson, Boston, Mass.; W. C. McClellan, Boston, Mass.; R. D. Wood & Co., Philadelphia, Pa.; Jesse W. Starr, Jr., Philadelphia, Pa.; W. W. Taylor, Philadelphia, Pa.; Saml. R. Bullock & Co., New York; N. G. Green, New York; Stewart, Sherreffs & Co., Richmond, Va.; Anderton & Foster, Talladega, Ala.; Peter Herdic, Williamsport, Pa.; Moffat, Hodgkins & Clark, Watertown, N. Y.; J. C. Brewster, Raleigh, N. C.; Water & Gas Construction Co., Pittsburg, Pa.; National Water-Works Co., Dayton, O.; Goodhue & Birnie, Springfield, Mass.; American Water-Works & Guarantee Co., McKeesport, Pa.

The bids were received and opened in private, it being announced by the committee that they would take some little time to investigate the various bidders, and their different propositions.

It is a matter of interest to water-works investors and builders, to note the large number of responsible parties who made offers for this work, as it shows that investments of this character in the South are being sought after, and that any objection to them is fancied, rather than real. The South offers a better and safer field for water company investments, than any other section of the country; it is rapidly growing and recognizes, that with this growth, it must have abundant supplies of water for sanitary, fire and manufacturing uses, and for good, honest works they are able and willing to pay good prices.

CHICAGO'S POPULATION.—The total footings of the school census give Chicago a population of 703,817, an increase during the last year of almost 75,000. There are 141,855 white males and 144,170 females under twenty-one years of age; colored, 2,012 males and 1,132 females under that age; of the Chinese, twenty-eight are under twenty-one. Of the colored, 4,399 were women, and of the Mongolians, twenty-two. There are also 53,090 males and 53,307 females under six years of age. Twenty-nine thousand two hundred and thirty-one attended other than public schools, and 471 between twelve and twenty-one cannot write or read.

THE SOMERVILLE & RARITAN (N. J.) WATER CO., which has a capacity of supplying both these places daily with 500,000 gallons of Raritan river water, has laid about five miles of 4 and 6-inch pipe during the past year, and has had a steadily increasing demand for new taps. The growing popularity of the company is said to be due to the Hyatt Pure Water system, which was adopted a year ago. The Raritan river is very muddy and loaded with washings a great part of the year, and until the water was purified by this system, the citizens objected to it and for several years declined to use it. The water is now delivered to them pure and sparkling at all times, and they are so well pleased that the water company contemplates doubling the capacity of the plant to meet the increasing demands for water.

ANN ARBOR, MICH., WATER.—The following is the result of the analysis of the water-works water sent a few weeks since to the University of Michigan by the Board of Public Works:

	No. 1.	No. 2.
Ammonia-albuminoid, parts per million	0.25	0.24
Grains per gallon	0.0146	0.0139
2. Ammonia free, parts per million	0.04	0.04
Grains per gallon	0.0023	0.0023
3. Nitrogen of nitrates and nitrates, parts per million	0.31	0.29
Grains per gallon	0.018	0.017
4. Nitrogen of nitrates alone, parts per million	0.005	0.005
Grains per gallon	0.0029	0.0029
5. Chlorine of Chlorides, parts per million	8.5	9.0
Grains per gallon	0.496	0.525
6. Permanganate, Reduction Quantative	slight	
Hardness, U. S. gallons, Clark's scales	15°	15°

ALBERT B. PRESCOTT,
Chemical Laboratory, University of Michigan.

The analysis as given above is highly satisfactory to the Board of Public Works, who are now fully convinced that the quality of water in this city is superior to that furnished in most other cities in the State.

WATER PURIFICATION AT HORNSEA (ENGLAND).—Mr. Holmes, the engineer of the Hornsea water-works (England), has adopted an ingenious arrangement for filtering and purifying the water supplied by the company there. The Hornsea water is pumped from a bore whose bottom is on a level with the surface of the Mere, the water being obtained from the chalk. At first it was far from satisfactory, and formed such a scale upon the boilers that it materially affected their working. Mr. Holmes set himself the task of remedying this state of things. The water has always been pumped into a tank, and supplied thence to the town. Mr. Holmes had a wooden tank formed inside the larger one, and he so spread out the water pumped upwards that it descended into the wooden tank in the form of rain. The air getting to the water as it descended, oxidised it, and, of course, made it purer. Inside this wooden several smaller tanks were constructed, through which all the water passed. The sides of these smaller tanks were made of prepared linen, and as the water passed through them they caught up the impurities, which it held in suspension. As the water flowed from the upper tank into the lower, from which the town is supplied, it was sent rippling over gravel, which further improved its quality. Although the contrivance is admirably adapted for the purpose it is intended to serve, it is hardly suitable for towns which require a large supply of water.—*Sanitary World.*

CHICAGO SEWAGE.—Engineer Swan, of the Sewage and Water Supply Commission, has made some inspections in regard to the proposed plan of using the sewage of the city for fertilizing purposes. The aim is to see if it is feasible to carry the sewage of the city to some remote point and then empty it in a diluted and liquid form over a sandy soil. This plan is successfully carried out in Paris and Berlin and other large European cities, and to a lesser extent at Pullman, and the Commissioner is desirous of seeing if it will work in Chicago. Mr. Hering, in charge of the work, is not committed to this scheme or any other scheme; but at all events it is proposed to relieve the Chicago river of all sewage matter, and any plan that will do this will be fully considered. Mr. Hering will order a corps of topographical engineers to Thornton when complete surveys will be made. One of the objections urged against this irrigation plan is that the city will be obliged to buy the land needed, which extends over the State line into Indiana. This will involve considerable expense, but whether it would cost more than the other plans cannot be told until the ground has been carefully surveyed. Mr. Hering intends if possible to complete his labors and submit his plans for the action of the City Council, in order that whatever legislation is necessary to accomplish the work may be got from the next Legislature. Further delay, he thinks, would be dangerous, as the matter has already been neglected by the city too long.

RED RIVER VALLEY DRAINAGE.—At a meeting of the Red River Valley Drainage Commission, held at Crookston, Minn., it was reported that Clay, Norman, Polk and Marshall counties had made arrangements for their apportionment of the money for the topographical survey of the valley, and the chief engineer was instructed to put two more surveying parties into the field immediately, and push the enterprise as rapidly as possible consistent with good work. The counties have taken hold of the matter in earnest, and the committee are urging the work forward. The work began July 30 in Polk county at the junction of the Sand Hill river with the Red river of the north. The plan of prosecuting the work is by tracing the section lines east and west, recording elevations at each section and quarter section corner, and such intermediate points as may seem of value. The four instrument men start from a common point and level on parallel section lines, usually checking on each other at the close of the day by means of tie lines, thus determining the comparative value and correctness of each man's work. A field map is kept in connection with the survey, which is corrected and filled in as the work proceeds. The map shows that the east side of the marsh near Beltrami is 98 feet above low water mark of the Red river. Across the marsh from the railroad there is a fall of 30 feet in ten miles toward the west. This slope is uniform and the minimum fall will not be less than 2 feet per mile, and probably can be made to reach the full average of 3 feet. East of the marsh the lines of drainage are not toward the stream, but parallel with it. The lower sand hill seems well adapted in size and fall for the outlet of this district. It has a number of tributaries which terminate at the west edge of the swamp, and which can be made available for drainage outlets.

NEWS OF THE WEEK.

Railroads, Bridges and Canals.

Columbus, Saline and Southeastern Railroad.—The work, which has been pushed very rapidly lately, has met with an obstacle that will for a time impede its progress. The grade is now completed about a mile and a half out from Parsons, Kan., east, and the force transferred to the west end, which comes up to the Missouri Pacific R. R. and Fort Scott and Gulf R. R. tracks, across which the right of way has not yet been secured. During the employment of the force on the east end, the two latter companies have thrown down a complete net work of tracks across the intended path of the Salina road. These tracks are laid with old rotten ties and discarded ones, and are in no condition to be used. The Salina and Columbus has taken steps for the condemnation of this route, and will proceed with their work in a few days.

The Augusta and Newberry R. R. is rapidly being pushed to completion. Over 600 hands are engaged grading the road and the sections between Augusta, Ga., and Edgefield. One hundred and fifty hands are employed grading from Edgefield to Saluda under Capt. George Wilkinson and Messrs. Rice and Coleman, who have the contract fron Newberry (S. C.) to Saluda, and are rapidly pushing the work. The entire road will be completed in less than twelve months.

A New California Line.—Considerable excitement has been created in Willows, Cal., by the appearance of C. E. Moore, engineer, in charge of a party of surveyors who propose to run a line from Willows westward to the mouth of Grindstone, and across the range to the coast. The work is under the direction of the Pacific Improvement Company, and if the proposed line is constructed, as it probably will be, it will open up a country of great resources tributary to the town.

The Gulf and Pacific R. R.—D. McLeod, who has the contract for grading the road, broke dirt at a point on the Missouri Pacific R. R., one and one-half miles this side of Letots, Texas, and will work northwestward. It will only require 3,000 feet of trestle to cross the bottom. The Gulf and Pacific people have every confidence that Dallas will raise the $50,000 which has been asked of her, and they say they will go right on with the work of constructing the road. A force of graders will be put on at the other end of the line in a few days.

The Missouri, Iowa & Nebraska Railroad was sold at Keokuk, Ia., August 19, by Master in Chancery Lomax. The road was sold in two portions. The first from Keokuk to Humeston was bought for $500,000, by T. DeWitt Cuyler, of Philadelphia, his being the first and only bid. The other portion, that part of the road extending from Humeston to Van Wert, was also bought by Mr. Cuyler, his being the only bid, and the amount being $100,000. Mr. Cuyler tendered the money, and stated that he had purchased the road in the interest of the bondholders.

Bridge Moving.—At Summer Hill Station on the Pennsylvania Railroad a difficult engineering feat has been accomplished. Half a dozen men, under the supervision of Master Carpenter Webb, of the Pittsburg Division, moved an iron bridge, weighing 190 tons, a distance of thirty-two feet in forty-eight minutes. This is the third operation of the kind since May. There was no impediment to the passage of trains, the rails being elevated accordingly as the bridge was lifted and ballasted by the trackmen, the bridge was removed in order to substitute a stone arch. Three sixty ton jacks were placed under each end. All the iron bridges on the Pittsburg Division, after being in use for twenty-five years, are to give place to stone. Heavy locomotives are to be put on the road.

A Stub Railroad.—At a recent meeting of business men of Rochester, Minn., a proposition was laid before them by W. H. Valleau, of Decorah, Ia., who claimed to represent the Milwaukee & St. Paul R. R. Co. The proposition was that a stock company should be authorized in the city to build, equip and operate a stub road from Rochester to Spring valley. The road, he said, would cost $180,000, and the rolling stock for local traffic, $14,000 more. It is estimated that $80,000 could be raised by bonus, leaving the stock company to put up $100,000. The friends of the plan suggest that after the road is partly completed, the road can be mortgaged for sufficient to complete it. The following committee were appointed to convass the matter and see if the business over the proposed road would pay a reasonable interest on the investment: M. J. Daniels, J. R. Cook, Walter Hurlburt, T. H. Bliss, D. H. Williams, A. Nelson and Mayor O. S. Porter. It was stated that the Milwaukee and St. Paul R. R. Co. would reserve the right of purchasing the new road at the end of two years at an advance of ten per cent. on the stock invested.

Vicksburg Harbor.—A meeting of the Vicksburg, Miss., Harbor Committee was held recently, for the purpose of exchanging views with Capt. Willard, United States Engineer in charge of the office at that point. He said the River Commission would make a tour of inspection at an early date, when they would decide as to what plan they would adopt in regard to the improvement of this harbor. There are two feasible plans; one is to dredge a canal or inlet to the lake and keep it open, and the other is to aid the current in its tendency to cut back into the lake again, by building revetements on the Louisiana shore above. This latter plan will not only have the desired effect, but will protect the work already done on Delta Point,

opposite the city. If the canal is dug, he says it is probable that sand pumps will be used instead of dredges. The Commission is at liberty to adopt either plan. The president of the harbor commitee will open correspondence with the River Commission at once, in order that they may be informed in the premises.

Contracting.

Prison.—Proposals for about $140,000 worth of work on the new Philadelphia County Prison, to be constructed near Holmesburg Junction, were received and opened recently by a committee of the Board of Inspectors of the County Prison having power to act. R. A. Malone & Sons, of Lancaster, were declared the successful bidders, and contracts were awarded to them.

Railroad.—The contract for the first seventy miles of the Northwestern Extension of the San Antonio and Aransas Pass Railroad has been let, and the plows were started on the 18th., the first scraperful of dirt being turned by D. S. Irons, of Boerne, and the second by Chief Contractor Nelson. The road goes via Leon Springs, Boerne, Center Point and Comfort to Kerrville, none of which towns have ever seen a railroad.

Canal Work.—The plans that were to have been submitted to the Canal board on the 16th., are for lengthening locks Nos. 34 and 35 in the Oswego canal to 220 feet, double their present size. They will be so constructed as to admit of the canal being deepened two feet without necessitating additional work on the locks. The first is Mud lock, the second is in Phœnix, and the last near Fulton. As there was no quorum of the Canal board the lettings advertised were necessarily adjourned.

Court House and Jail.—Bids for the construction of the new Court House and Jail at New Lexington, Perry county, O., have been opened by the County Commissioners. Thirty bids were received, of which number three were for the entire work. These bidders were, T. B. Townsend, of Zanesville; Hibbard & Schaus, of Newark, and a Columbus firm. Hibbard & Schaus carried off the contract at their bid of $84,600.00. T. B. Townsend was the next lowest bidder. The contract price is $1,000 less than the amount of the appropriation, and $10,000 less than the architect's estimate.

Canal Locks.—The bids for lengthening guard lock 1, and locks 5 and 6, have been opened at Albany, N. Y., with those results:—No. 1, Hughes Bros., Syracuse, $16,796; Howard Soule, Syracuse, $17,487.75; William Dickison, Syracuse, $16,044.10; R. P. Smith & Co., Rochester, $15,105; William Patrick, Phœnix, $15,842.50. For lock No. 5, Hughes Bros., $30,978; Michael Degnan, $27,462.50; Howard Soule, $30,881; R. P. Smith & Co., $24,109.50. For lock No. 6, Howard Soule, $22,759.75; William Dickison, $20,790.60; R. P. Smith & Co., $19,851.50; John J. McLean, New York, $20,783; Williard Johnson, Fulton, $22,561.50. No quorum of the canal board was present, and the contract has not been let.

Levee Work.—The following levees have been let in Louisana by Major Richardson, chief engineer of the State Board of Engineers:

Legarde Levee, Lafourche parish, right bank—To William Dowling, 17 cents per cubic yard.

Sevin Levee, Lafourche parish, right bank—To William Dowling, 17 cents.

Energy Levee—To P. J. Terrill, at 18 24-100 cents per cubic yard.

Highland Levee, left bank, Lafourche—To George Dionne, 19 cents per cubic yard.

Bivouac Levee, Lafourche, left bank—To George Dionne, 19 cents per cubic yard.

Woodland Levee—Assumption parish, left bank of Bayou Lafourche—To P. J. Terrill, 21 24 100 cents per cubic yard.

Preout Levee, St. James parish, right bank—To A. J. McPhail, 21 99-100 cents per cubic yard.

Of the above, there are about 30,000 cubic yards to be placed in Bayou Lafourche, and about 19,500 in the Preout.

Water-Works.—The following are the bids received for the construction of water-works at Martin's Ferry, O. Four classes of pumping engines were bid on, viz.—1, Vertical, direct-acting, compound, duplex engine; capacity, 1,500,000 gallons; 2, same type, capacity 1,000,000 gallons; 3, Vertical, direct-acting, single cylinder, duplex engine; capacity, 1,500,000 gallons; 4, same type, capacity, 1,000,000 gallons. The contract was awarded to the Gordon, Maxwell Co., class 2, at $7,900. The other bidders were Chandley Bros., (Wilson, Snider & Co.'s pumps); Wilson, Snider & Co.; Booth & Flinn, (Worthington pumps), and the Holly Manufacturing Co., (five bids).

The contract for the pipe and castings was awarded to the Cincinnati & Newport Iron & Pipe Co., at $30.93 per ton for cast iron pipe, and $60 per ton for special castings. The other bidders were Dennis Long & Co., Ohio Pipe Co., R. D. Wood & Co., Chandley Bros., and Booth & Flinn, (bid withdrawn).

The contract for stop valves was awarded to Bailey, Farrell & Co., 4-inch, $8.63; 6-inch, $14; 8-inch, $20.97; 10-inch, $29.06; 12-inch, $38; 14-inch, $60.40, (Ludlow pattern); for hydrants, to Bourbon Copper & Brass Works, at $33. The other bidders on valves and hydrants were J. R. Hutchinson; Rees, Shook & Co.; Roe, Stephens Co.; Galvin Brass & Iron Co.; Whittier Machine Co.; Chapman Valve Co.; Frontier Brass & Iron Co.; Eddy Valve Co.; A. and W. S. Carr & Co.; Wm. Flinn; R. D. Wood & Co.; Chandley Bros., and the Holly Manufacturing Co.

The contract for laying the pipe was awarded to J. J. Rumsey, 14-inch, 35 cents; 12-inch, 26¾; 10-inch, 25; 8-inch, 22 6-inch, 18¾; 4-inch, 16 cents; setting hydrants, $4.75; setting valves, 4-inch, 75 cents; 6-inch and 8-inch, $1; 10-inch, $1.10; 12-inch, $1.25; 14-inch, (no charge). The other bidders were Carothers & Hutzel, Booth & Flinn, H. M. P. Dole & Co., W. H. Chandley, Al. Graham and Chandley Bros.

The contract for the reservoir was awarded to J. J. Rumsey at the following prices: earth excavation, 29½ cents per cubic yard; slope puddle, $1.25; bottom puddle, $1.50; pipe trench puddle, $1.25; broken stone lining, $1.50; slope paving, sandstone, $1.70 per square yard; sandstone coping, $1.20 per lineal foot; sandstone rubble masonry, $5.60 per cubic yard; concrete, $3.55; sodding, 18 cents per square yard; soiling and seeding, 25 cents per cubic yard; gravel walk, 90 cents per cubic yard. The others bidders were A. L. Funkhauser, Booth & Flinn, D. F. Manahan and Chandley Bros.

The contract for the engine and boiler house substructure was awarded to Chas. Seabright at the following prices: earth excavation, 65 cents per cubic yard; concrete footing, $4; rubble masonry, $4.25; range work masonry, $6; W. I. floor beams, 3½ cents per pound; oak lumber, $28 per M.; brick and concrete arched floor, $15 per cubic yard; back filling, 20 cents per cubic yard. The other bidders were Chandley Bros. and Booth & Flinn.

The contracts as awarded aggregate $82,416; the engineer's estimate was $83,428, not including engineering and contingencies, for which the usual 10 per cent. has been estimated. The engineer is Mr. George Hornung.

CONTRACTORS INTELLIGENCE.

Engineering and Building Materials.

WHOLESE PRICES.

Chicago, August 26, 1886.

IRON.

STRUCTURAL IRON.			
Angles	2.30	@	2.40
" Steel, not in stock			
Tees			2¼c.
Beams, channels, American			3½c.
Tank plates			2.40
Shell plates	3.00	@	3¼c.
Steel plates, Tank			3c.
WROUGHT-IRON PIPE.			
Butt welded, black Discount			42½
" " galvanized "			32½
Lap " black			37½
" " galvanized "			40
Boiler Tubes			
RAILS.			
Steel	$37.00	@	$38.00
Old Rails—Iron	20.00	@	21.00
" " —Steel			
R. R. spikes			2 40
R. R. splice-plates	1.90	@	2.00
R. R. track bolts, square nuts			3c.
Barb wire fencing, galvanized			4c.
" " painted			3¼
CORRUGATED IRON-SHEET.			
Wire gauge 16 to 20	22	24	26
Black, per lb 3½	3⅞	3½	3⅞
Galvanized per lb 8¾	9¼	9¾	
Nos. 28		6.00	4
NAILS.			
Iron, per keg	2.10		
Steel, " "	2.20	@	2.25

METALS.

COPPER.			
Lake Superior			10.25
LEAD.			
Com. Domestic	4.75	@	4.80
Lead Pipe	.06¼	@	.06¾
Tin-Lined Lead Pipe	.15		
Sheet Lead	.07¼		
ZINC.			
Sheet	5.65		

BRICK.

Common per M	7.00	@	7.50
PRESSED.			
Chicago, Anderson	18 00	@	27.00
Indiana	16.00	@	22.00
Perth Amboy, Buff			50.00
" " Mottled			50.00
Tiffany	22.00	@	30.00
St. Louis			27.00
Trenton	50.00		
Philadelphia			45.00
Baltimore			55 00
Milwaukee			25 00
Zanesville			30.00
" Enamelled			30.00
Toledo Red, common			12.00
" " stock			17 00
Fire Brick	25.00	@	30 00

LIME, ETC.

	Per Cask.		
Chicago Lime	.65	@	.75
Wisconsin "	.90	@	1.00
Hair—cattle, per bu	.20	@	.25
" —goat, " "			.40
Sand, Lake shore, per yd	1.00	@	1.25
Plaster of Paris	2.00	@	2.50

CEMENT.

Portland	3.25	@	3.50
Milwaukee, Utica, Louisville, Akron	1.00	@	1.25
Keene's Coarse	7.50	@	9.00
" Fine	11.00	@	12.00

STONE.

	Per cubic foot. F. o. b. cars; Chicago.		
LIMESTONE, Promiscous blocks.			
Blue Bedford			.65
Buff			.56
Joliet	.35	@	.50
Lemont	.40	@	.50
FOUNDATION.			
Dimension, on dock	.16	@	.20
Rubble, per cord	.20	@	.25
Sidewalks, laid, 8" to 12" sq. ft.	.65	@	.75
" " 6" to 8" " "			
Planed	.40	@	1.00
SANDSTONE, Promiscous blocks.			
Amherst	.60	@	.75
Berea	.55	@	.65
Philadelphia brown stone			1.50
Connecticut " "			1.50
Carbondale			1.10
Malone Blue Euclid	.55	@	.65
New York Bluestone	.35	@	1.40

MARBLE.

Georgia			1.50
Vermont			3.00
Tennessee, Red			4.00
" Knoxville	2.50	@	5.00
Italian, Veined			

SLATE.

Green Roofing, per square			6.50
Purple " " "			6.50
Red " " "			13.00
Black Lehigh " "	5.75	@	6.75
" Chapman's " "	7.30	@	8.00
" Bangor " "	5.50	@	5.80

LUMBER, Car Lots.

BOARDS, ordinary dimensions.			
Pine, 1st quality clear	$46.00	@	$48.00
" 2nd " "	44.00	@	47.00
" 3rd " "	42.00	@	44.00
Common			13.00
SIDING.			
Pine	10.50	@	21.00
FRAMING TIMBER, Pine	12.00	@	17.00
Laths "			2.50
Shingles " sawed	2.40	@	2.60
" cedar	2.25	@	2.35
Pickets, pine	.09	@	.19
Posts, cedar	9.00	@	21.00
Pine, yellow southern	28.00	@	35.00
PINE, YELLOW GEORGIA,			
1st and 2nd clear, 4 inch flooring			35.00
" " 6 inch "			35.00
Boards	33.00	@	35.00

HARDWOODS.

Ash, 1st and 2nd, 1 inch	30.00	@	32.00
Maple, " " " " "	25.00	@	35.00
Walnut " " " " "	75.00	@	80.00
Oak White, 1st and 2nd, 1 inch	30.00	@	35.00
" Red " " " "	30.00	@	35.00
Cherry " " " " "			75.00
Beech, Red " " " "	25.00	@	30.00
Whitewood " " " "			
1¼, 1½ and 2 inches	26.00	@	30.00
Birch, Red, 1st and 2nd, 1 inch	35.00	@	40.00
Butternut " " " "	35.00	@	40.00
Sycamore " " " "	20.00	@	25.00
Gum " " " "	25.00	@	30.00
Rosewood, per lb	3c.	@	15c.
Mahogany, Mexican, per lb	.15c.	@	.20c.
" St. Domingo, per lb	.20c.	@	.25c.
" Cuba, per lb	.12c.	@	.20c.
California Redwood Lumber	50.00	@	55.00
" Shingles	5.25	@	5.50
" Pine	65.00	@	75.00
Mexican Spanish Cedar	150.00	@	300.00
Georgia Cypress Lumber, 1st and 2nd clear	35.00	@	40.00
Georgia Cypress Shingles	3.75	@	4.25
CALIFORNIA OAK.			
Plank	23.00	@	25.00
Timber	24.00	@	30.00

PAINTS.

	Drv.		In Oil.
Lead, White (American) Dry	7		7½
Zinc "	8, 10, 10	@	12
Red Venetian	2.6		12
Vermillion		@	75
India Red		@	20
Yellow Ochre		@	10
" Chrome	12 @ 20	@	20
Green "	12 @ 15	@	16
Black, Lamp	8 @ 25	@	15
Putty Bulk		2 Bladders	.3
Blue, Ultramarine	.16		.35
Whiting, dry	.1		
Litharge—American	.7		
Sienna, burnt	.9		.16
Umber, burnt	.7		.16
Oil, Linseed (raw) per gal	.44		
" " (boiled) "	.47		
Turpentine "	.38		
Varnish, coach	1.25	@	2.00
" shellac	3.25	@	4.00

ASPHALT.

BARBER ASPHALT.			
Pavements Laid:			
Without foundation, per sq. yd			2.00
With " " " "			2.00
Asphalt Blocks:			
Macadam foundation, per sq. yd	2.81	@	2.97
Without macadam foundation, per sq yd			2.75

Contractors Intelligence,

Reported by T. H. Boorman.

Engineering and Building Materials.

WHOLESALE PRICES.

New York, August 26, 1886.

IRON.

STRUCTURAL IRON.			
Angles		1.95c	@ 2.10c
" steel		2.35	@ 2.45
Tees		2.35	@ 2.45
Beams and channels, American		3.0	@
Tank plates		2.10	@ 2.20
Shell plates		2.4	@ 2.5
Steel plates, Tank		2.70	@ 2.75
WROUGHT-IRON PIPE. PITTSBURG.			
Butt welded, black	Discount		45
" " galvanized	"		35
Lap welded, black	"		60
" galvanized	"		42½
Boiler tubes	"		52½
RAILS.			
Steel (large lots at mill)		$34.00 @ $34.50	
Old rails		20.00 @ 20.50	
Old rails, steel		22.06 @ 23.00	
R R. spikes			2.40c
R R. splice-plates		1.80 @	2.00
R R. track bolts, square nuts		3.00	
Barb-wire fencing, galvanized		4.00 @	4.38
" painted			4.00
Corrugated iron			
Nails			
Iron, per keg		2.10	
Steel do.		2.20 @ 2.25	

METALS.

COPPER.			
Lake Superior		10.25 @	10.38
Other Brands		*8.25 @	9.75
LEAD.			
Com. Domestic		4.75 @	4.80
Lead Pipe		.06¼c.	
Tin-Lined Lead Pipe		.15	
Sheet Lead		.07¼	
ZINC.			
Sheet		5.60 @ 5.85	

BRICK.

Cargoes (afloat)			
Choice Brands		7.25	
Haverstraw	per M.	6.25 @ 7.25	
Fishkill		6.25 @ 6.50	
Up-River		5.50 @ 6.25	
Jerseys		5.50 @ 6.00	
Long Island			
Pale		4.50 @ 4.75	
FRONTS.			
Croton, red		11.00 @ 15.00	
" dark		11.00 @ 15.00	
" brown		10.00 @ 14.00	
Philadelphia pressed		27.00 @ 28.00	
Trenton "		25.00 @ 26.00	
Baltimore "		37.00 @ 41.00	
Buff "		33.00 @ 35.00	
Enameled English		85.00 @ 130.00	
" American		80.00 @ 120.00	
Fire brick		25.00 @ 55.00	
" American, No. 1		30.00 @ 35.00	
" " No. 2		25.00 @ 30.00	

ASPHALT.

ROCK.			
French		$20.00 @ 25.00	
German		15.00 @ 20.00	
According to quantity or brand, and whether taken from vessel or store.			
PAVEMENT.			
Barber's Asphalt		$2.50 @ $3.00	

LIME.

Rocklock Cement Co.'s Ground	.80
Rockland, common per bbl	1.00
" finishing	1.20
State, common	.85
" finishing	1.05
Kingston, ground	.90
Add 25c. to above figures for yard rates.	

STONE.

Cargo rates at New York.

Amherst freestone, No. 1	per cub. ft.	0.95 @	1.00
" " No. 2	"	0.75 @	0.85
" " light drab	"	0.80 @	0.95
Berlin " in rough	"	0.75 @	1.00
Berea " "	"		
Brown stone, Portland, Ct.	"	1.00 @	1.35
" Belleville, N. J.	"	0.75 @	1.35
Granite, rough		0.45 @	1.25
Common building stone per load		2.00 @	3.00
Base stone, from 2½ to 6 ft. lengths, per lin. ft.		0.40 @	3.00
Concrete and macadam stone, Tomkins Cove, per cub. yd			$1.65

SLATE.

Purple roofing	per square	6.00 @	7.00
Green	"	6.00 @	7.00
Red	"	15.00	
Black Penna. (at New York)	"	4.50 @	5.00

LUMBER.

Prices for yard delivery in New York.

PINE, Common box	per M.	18.00 @	20.00
Choice	"	65.00 @	70.00
Tally plank, 1¼ in. 10 in. dres'd.	each.	.44 @	.50
Tally boards, dressed com.	"	.28 @	.30
SPRUCE, Boards dressed	"	.25 @	.28
Plank, 1¼ in	"	.28 @	.30
" 2 in.	"	.38 @	.40
" 2 in. dressed	"	.43 @	.45
Timber	per M.	13.50 @	16.00
HEMLOCK, Boards	each.	.18 @	.20
Joist, 2¼ × 4 to 4 × 6 in		.16 @	.44
OAK	per M.	55.00 @	65.00
CYPRESS 1, 1¼, 2 and 2¼ in	"	35.00 @	40.00
YELLOW PINE, Girders	"	25.00 @	30.00
Dressed flooring	"	28.00 @	35.00
SHINGLES, Extra shaved pine, 16in.	"		
" sawed 18 in.	"	5.75 @	6.00
LATH, Cargo rate	"	2.00 @	2.10

PAINT.

Lead, white, American dry	per lb	.04¾ @	.06½
" " in oil pure	"	.07 @	.07½
" English, B. B. in oil	"	.08½ @	.09¾
" Red, American	"	.06½ @	.07
Litharge	"	06½ @	.06
Venetian red, American	"	.01 @	.01¾
Indian red	"	.08 @	.10
Vermillion, American lead	"	.10½ @	.11½
Paris green	"	.15 @	.18
Umber, Amer. raw and powdered	per lb.	.01¾ @	.01¾
Drop black, Amer.	"	.07 @	.13
" " Eng	"	.11 @	.13
Chrome green	"	.10 @	.25
Oxide zinc, American	"	.03¾ @	.03½
" French	"	.05½ @	.07½

CEMENT.

The following price current is made up entirely from quotations furnished us directly by the firms dealing in each brand; the prices are understood to be wholesale in New York, subject to such special rates as large quantities may warrant:

CALVIN TOMKINS:		
"Old Newark Co's." Cement		$1.10
BAETJER & MEYERSTEIN:		
Hanover Portland	$2.60 @	$2.65
BELLONI & Co.:		
Hemmoor "Crown" brand		2.50
JAMES BRAND:		
Burham	2.25 @	2.50
Fewen	2.25 @	2.50
BROOKS, SHOEBRIDGE & Co.	2.45 @	2.60
HOWARD FLEMING:		
Gibbs' English Portland, 400 lbs	2.50 @	2.75
K. B. & S. " "	2.25 @	2.50
Stettiner, German	2.65 @	2.85
Lagerdorfer, "	2.45 @	2.75
Fieve, A 1, Belgian	2.35 @	2.50
Roman	2.75 @	3.00
Keene's Coarse	4.75 @	5.50
" Fine	7.75 @	8.50
" Superfine	8.50 @	10.00
FISHER, ERSKINE W.:		
Stettin (German) Portland Cement	2.40 @	2.75
GABRIEL & SCHALL:		
Vorwohler "Lion"	2.65 @	3.10
HUDSON RIVER CEMENT Co. Rosendale		0
JOHNSON & WILSON:		
Saylor's American Portland	2.15 @	2.45
LESLEY & TRINKLE, Philadelphia, Pa.:		
"Giant" Portland	2.20 @	2.40
Improved "Union"	1.25 @	1.50
Union	1.10 @	1.20
MARCIAL & Co.:		
J. B. White & Bros. Coarse Keene's	4.25 @	4.50
" Superfine	7.25 @	7.50
" Portland	2.65 @	3.00
NEW YORK CEMENT Co.:		
Rosendale		1.10
N. Y. & ROSENDALE CEMENT Co.:		
Rosendale, "Bridge" brand		1.10
SINCLAIR & BAUSON:		
Alsen's Portland Cement Works	2.35 @	2.85
K. B. & S.	2.25 @	2.50
STANDARD CEMENT Co		
E. THIELE:		
Dyckerhoff	2.90 @	3.25
UNITED STATES CEMENT Co.:		
English Portland	2.25 @	2.40
German "	2.00 @	2.15
Standard	1.50 @	1.65
Windsor and Improved Rosendale	1.00 @	1.10
UNION AKRON CEMENT Co.:		
Akron "Star" brand	1.00 @	1.10

MARKET SUMMARY.

Brick are in active demand and all good qualities command quick sales. Haverstraw firsts, have sold freely at $7.25 per M. and some Fishkill at $6.50; as for some weeks past the supply is only equal to the demand with manufacturers all busy. Face brick continues, in good demand, and manufacturers are pressed to supply shape brick as required. The Lumber Market is firmly active, with a tendency towards higher prices for Spruce, random cargoes sell at $13.50 to $16 00, and special schedules at $16 50 to $18.50 per M. State Spruce is higher and quotations are $17.50 per M. Yellow Pine random cargoes are $18 to 18.50 per M. Specials $19.00 to $21 per M. Dry flooring boards $21 to 22 per M. Lath not quite so firm, and sales of St John and Maine are reported at $2.00 with superior quality lots held at $2.10 per M. Rosendale cement remains quiet nominally held at $1.10, with sales from 90 cents to 95 cents per barrel reported. Portland cement, continues in excellent demand, and importers in some cases report supplies received not sufficient for their demands, among the sales reported this week, is that of Howard Fleming of 5 000 barrels "Gibbs" for use by the city of Des Moines, Iowa. Plaster, in seasonable demand, and sales of St. John reported at $1.20 per barrel. Lime shows no new feature, prices unchanged with a rather meagre demand for State. The Hair Market is as last week with a fair amount of out of town orders. Paints and Oils show no alteration. Turpentine is firm at 35½ cents per gallon, and Linseed Oil is held at 43 cents for city. The Hardware manufacturers do not find orders as freely given as they would desire, and it is reported that concessions have been made on Locks, Wire Rods, Coil Chain &c., demand for nails very moderate with prices quoted $2 10 to $2.20 per keg for 10d. to 60d. according to size of invoice. The price of Pig Tin has again hardened and sales of Straits have been made at $22 10, the demand for Tin Plates continues moderate, and the prices remain as last week The dealers in Building Materials report generally a good trade with an excellent outlook for Fall Trade.

BUILDING ITEMS.

Mr. Geo. Edw. Harding, of 40 Exchange Place, has associated with himself Mr. Fredk. P. Dinkelberg. They report plans completed for No. 1,236 Broadway, store and flats above. 7.6 by 72, three stories and basement to be of Ohio stone in the Colonial style, and to cost $25,000. Messrs. W. A. & F. E. Conover contractors. They have also designed the decoration for the Cafe and Banqueting Hall of the Hoffman House, to cost $3,600, and have prepared designs for a country hotel to be built at a cost of $12,000 at Battletown, Clark county, Virginia, and a residence to cost $15,000 to be built at Brice, Va., for Mr. J. H. Renshaw.

Messrs. Renwick, Aspinwall and Russell, are busy on specifications for the Episcopal Diocesan House to be built at the expense of Messrs. C. L. Wolfe, at No. 29 Lafayette Place. The building is to be 40 by 131, four stories high and is to be built of white marble, brick and terra cotta in Italian Gothic style.

Mr. R. H. Robertson has planned a Parsonage, 28 by 94, to be built at No. 712 Fifth avenue, for the Fifth avenue Presbyterian church, which is to be four stories high, and will cost $75,000.

Messrs. George Matthias & Co., 252 Stewart Building, have completed plans for two, five-story brick tenements with stores to be built for Mr. Charles Kirchoff, on Eighth avenue near Forty-sixth street, at a cost of $30,000.

Mr. J. H. Valentine has drawn plans for thirteen brick tenements with stores, to be built for M. Gelston on First avenue and 106th street, at a cost of $180,0 0

Mr. Charles H. Bliss, of the "Rutland," will build two, four-story brick dwellings, 25 by 84, on the south side of Eighty-fifth street, 350 feet east of Ninth avenue, at a cost of $40,000.

Messrs. Chas. Buek & Co., architects, of Madison avenue and Fifty-second street, will built five brick and stone residences, to cost $100,000, on the north side of Eighty-first street, between Park and Lexington avenues.

Mr. Lawrence B. Valk, of the Tribune Building, has plans on the boards for a $36,000 Methodist Episcopal Church, to be built at Mount Vernon, N. Y., one at Tremont, N, Y., to cost $24,000, and one at Birmingham, Ala., to cost $17,000.

Messrs. McKim, Mead & White, have drawn plans for an Episcopal Church, to be erected of stone in the Norman style, 110 by 160, at Morristown, N. J., cost not yet estimated.

The Building Committee of the Freundschaft Club, have requested Messrs. Cleverdon & Putzel, C. W. Clinton, De Lemos & Cordes, McKim Mead & White and Schwarzmann & Buchman, to submit competitive plans for their new building by September 15th.

Architect Debevoise has had the amended plans for the new four-story and basement school building to be erected in Fiftieth street near Ninth avenue approved by the Trustees of the Twenty-second Ward, and bids are advertised for to be submitted by September 7th.

It is reported that the contract for the Poughkeepsie bridge has been awarded to Mr. George T. Fields, for the Union Bridge Co.

Mr. R. H. Robertson has drawn plans for a handsome brick and terra-cotta depot to be built for the N. Y. Central & Hudson River R. R., at Suspension Bridge. Estimates now being received.

Mr. John W. Decker will build six three-story houses on the west side of Forest Avenue, south of 165th, street at a cost of $20,000.

There was recorded in the clerk's office Poughkeepsie, on August 26, a mortgage from the Poughkeepsie Bridge Company to the Mercantile Trust Company of New York for $5,000,000. The mortgage covers a bridge to be constructed over the Hudson at this place and all the real estate, approaches and other property of of the company now owned or hereafter to be acquired by it, and is given to secure the payment of one equal amount of 6 per cent. bonus, to run fifty years from August 1, 1886. The mortgage is also recorded at Kingston.

BROOKLYN.—George Boemermann has submitted plans to the Buildings Department for the erection of a public hall, to be known as Lefferts' Hall, on the northwest corner of Nostrand and Gates avenues. It is to be 37.6x100 in dimensions, three stories in height, of brick, and to cost $20,000. The lot is a part of the old Lefferts estate, and of the park so long maintained there.

Moses Burtis has submitted plans for the erection of a five-story apartment-house, 30x96, to cost $25,000, at 149 Washington street.

McLaughlin & McConnell propose to build five apartment houses at St. John's place and Fifth avenue, to cost an aggregate of $50,000.

Stamping Waste Tin Plates.

(From the London Ironmonger.)

It will be very interesting to note whether or not the tin plate manufacturers of South Wales will largely follow the example of W. Gilbertson & Co., in declining to stamp waster tin plates. This company now stamp their "Old Method," plates after the tinning process has been completed, and they only stamp such plates as are critically adjudged to be "Perfects." They stamp no wastes with the above brand, and announce that no wasters of their production will, with their knowledge or sanction, be sent to the United States, but will be disposed of in England under some other mark. From the first portion of this arrangement there can be no dissent and it ought to secure for W. Gilbertson & Co.'s brand a high reputation and a large sale in the United States. The wisdom of the plan thus adopted is so obvious that we might expect it to be generally adopted in the tin plate trade, yet the sinuosities and subtle intricacies of that business are so numerous and confusing that such a result is highly improbable. Deceptions and "juggles" by means of wasters are so profitable to many of the merchants and dealers that they will probably resist any such change, whilst the speculators of course, will oppose any alteration which would be likely to simplify the business or to limit their opportunities for "hocussing" both buyers and sellers. A good example has been set in this instance, however, and we hope that some, at least, of the manufacturers will have sufficient backbone to follow suit.